175 484 conduct against the explorers recognized by the authorities, and he found support from the new Russian governor for East Siberia, Muraviev, who later was made a count and received the honorary name of Amurskii. Muraviev got him command of a small ship, with which Nevelskii headed for the Far East from Kronstadt and in 1849 began his explorations, even before he had received permission to do so. He determined that the connection to the north between the sea and the Amur Gulf could be traversed at all times by ocean-going vessels with a depth of up to 4 meters, and that Sakhalin was an island, and that accordingly during the warm seasons ocean-going vessels with a depth of up to 5.50 meters could get unhampered to the mouth of the Amur from the Sea of Japan through Tatarskiy Proliv /sound/. This news caused a sensation in Petersburg and awakened anew the greatest interest in the Far East both among the state leaders and among the public. In the meantime explorers such as Middendorff, among others, and later also Nevelskii himself reported that the area east of the Lesser Khingan and of the Ussuri had, for all practical purposes, never been brought under Chinese administration and that it was, therefore, in fact free. Thereupon Muraviev took possession of this area and also the Amur country. All of these events are reported in detail, but from the Chinese point of view, by Aitchen K. Wu in his work appearing in 1950, "China and the Soviet Union" (231).

231. Aitchen, K. Wu. China and the Soviet Union (London, 1950).

[418] In 1858 Russia and China signed the Treaty of Aigun, in which the Amur country was declared to be a Russian possession, while the Ussuri country was to be administered jointly by the two countries. But in 1860 in a treaty with Peking Russia also received the Ussuri country and was promised the Island of Sakhalin. With this, all regions which today belong to /27/ the Soviet Union came under Russian administration. In 1860 Vladivostok was founded, in whose name the imperative of Russia's Far Eastern policy was expressed: "Rule the East! "

General Survey

•133 Transbaykal, like the other border areas in the Far East, belongs to the east Siberian mountain country. In contrast to the other parts, Transbaykal has a generally regular shape. Numerous mountain ridges traverse it in strikingly parallel strips from southwest to northeast. Extended mountain ridges and almost equally long valley depressions constitute the distinguishing features here, while the contrast between mountains extending irregularly and lowlands lying in between is characteristic of the Amur and Ussuri areas and also of the extreme northeast. 133

Transbaykal, lying between heavily forested, damp Siberia and the dry steppe belt of upper Asia, forms a transition area in terms of its landscape. The Mongolian steppes, which in strips are semi-wastelands, cross the border from the south and in long tongues stretch into the broad valley plains between the mountain ridges. In this fashion the steppes reach even Lake Baykal and form islands in the middle of the wooded area, for example on the Barguzin River and in the valley of the Upper Angara. On the other side the Siberian taiga presses in on mountain ridges far toward the south to the area around the upper course of the Onon and the Ingoda. Thus the Central Asiatic steppe and the north Asiatic continental forest penetrate into Transbaykal. There comes into being a magnificent forest steppe landscape. In the south the steppe predominates, but the farther north one goes the more the forest descends the slopes from the rounded-off mountain ridges until finally the forest fills the ever narrowing valleys. The steppe valleys gradually become grassy meadows, which finally turn into swampy valley meadows and even into swamp forest in the north. 133 /137

The ground relief in Transbaykal, however, is not so varied as would appear from first glance at the map. The valley plains lie generally 600 to 900 meters above sea level, and the ridges of the mountain chains are between 1,000 and 1,400 meters high, so that accordingly there is only a relatively slight difference in height. And even this is blurred by the fact that the slopes are contiguous and rise only very slowly and gradually. As a rule they show no strongly marked ridge but more often have a long, rounded ridge, indeed often in the form of a plateau. In this the predominant forest covering contributes to leveling the unevenness of the relief. Individual mountains, in their considerable absolute heights, extend beyond the tree line. Mostly there are roots, which have withstood the storms and which with their naked round forms project like bare skulls above the general /28/ thicket of trees. The appearance has brought to them the appropriate Russian name of "gol'tsy" (singular - 133

133 "golets"), which means the same as "baldy" or "bald-head." These goltsy, which appear in Transbaykal only in individual instances, are extremely typical for all mountain areas in the Far Eastern region.

101 311 Culturally, too, Transbaykal has to a remarkable degree a transitional character. The steppe regions, the steppe valleys, and the steppe islands have since time immemorial been the seat of nomadic cattle-breeders, in this case the Buryat, an intelligent and energetic tribe of Mongols, who have kept themselves on the steppes which suit their nature and culture. It is interesting to determine how exactly their expansion even today coincides with their natural landscape. The Buryat penetrate only rarely into the forest areas; more often they leave these to the forest peoples of the Tungus, who even today live there still as hunters and reindeer breeders. The Buryat were the first people to give successful resistance for a time to the invading Cossacks, but as nomads they later had to clear the field for the Russians who were seeping in slowly and pursuing agriculture. Buryat helped themselves, however, by adjusting: they often went over to agriculture themselves, and they appropriated for themselves the advantages of Russian culture. Thus, even though they were penetrated by Russians, they were able to retain their original regions and to attain a cultural level which raised them above all their Mongolian tribal brothers on the other side of the Soviet Russian border. Because of the invasion by the Russians, there came into existence here a cultivated landscape which was inserted between the completely forested areas in the north and the pure steppes in the south; but corresponding to the spacious transition region, this cultivated landscape did not appear in a clossed-off zone, but in culture islands. In extensive regions in the south near the border, the Buryat even today still lead their old nomadic, cattle-breeding life. 132 The fact that the bulk of the rainfall occurs in the summer is favorable for agriculture. Chita, lying in the middle of the land, has an annual rainfall of only 319 millimeters. However, 289 millimeters of this falls during the vegetation period so that a relatively sufficient [243] amount of dampness is available, in conjunction with continental warmth, to make possible a very high yield of summer wheat. This makes Transbaykal an important wheat producer and the principal supplier for all of east Siberia.

133 The Amur country is adjacent to Transbaykal, without a clear border, north of the northern arc of the Amur. In its large morphological traits it is no less varied than Transbaykal, though the differences in

height are greater; for in the Amur country the bottoms of the valleys sink to between 500 and 200 meters, while the mountain ridges still retain heights between 1,000 and 1,500 meters. The number of mountain ridges, which retain their rounded-off, plateau-like character with numerous "gol'tsy" /29/ set on them, decreases. Likewise there disappears the parallel lining up of the main chains in a northeastern direction, a trait which is so marked in Transbaykal. The main mountain chains in the Amur country, on the contrary, run predominantly from west to east, while others cross them almost at right angles. Thus, in contrast to Transbaykal, the geological features have greater dimensions here, where broad plains are inserted between the individual mountain chains, and toward the Amur these plains assume the character of low plains. The thickly settled Zeya-Bureya Plain should be mentioned first. But here too the corresponding traits appear which--apart from the mountains--are expressed in the main direction of the rivers and their valleys. A southwest-northeast direction (like Lake Baykal), such as occurs in the course of the Argun, the Selemdzha, the Bureya, and the lower course of the Amur, crosses a northwest-southeast direction, which appears most clearly in the middle course of the Amur and in the direction of the Gilyuy. Many rivers, such as the Zeya, follow first one direction and then the other. /33

The difference in the landscape from Transbaykal is great since the Pacific Ocean has a powerful effect on the Amur country which lies in the sphere of the east Asiatic monsoon. The nearness of the great continental mass, to be sure, brings harsh winters; but the summer is warm and brings at the same time heavier rainfall than in Transbaykal. Generally the annual rainfall is more than 500 millimeters, of which usually more than half falls in the three summer months of June, July, and August alone and brings forth a most luxurious plant growth. While in Transbaykal the valley areas remain free of tree growth because of the dryness, here there is excessive dampness, which makes it impossible for forests to thrive in the valleys, meadows and level areas. This excess of summer rain gives the landscape its special stamp. Swampy reed thickets along the rivers, broad meadowlands covered with high grass and lying on the higher plains, giving way to little woods on the dry hills, and on the slopes and ridges of the high mountain chains forest thickets often difficult to penetrate and, in contrast to the Siberian taiga, containing oaks and deciduous trees--these are typical of the entire Amur country. /32 /37

The excess of dampness in vegetation season is a handicap 000

311 The excess of dampness in vegetation season is a handicap
even for agriculture and makes difficult the extension of the cul-
tivated areas. New land for cultivation must as a rule be won
laboriously from nature by drying it out. More and more the ex-
tended Zeya-Bureya Plain and the area along the Amur have be-
[162] come quite thickly settled, and large parts of the famous "Amur
Prairie" have been transformed into cultivated land. It is pre-
dominantly Russians who live here. The Chinese who immigrated
here earlier have been pushed back over the Amur--in part by force.
In all the rest of the area, however, /30/ untamed nature dominates
the landscape, which is traversed at most by a few Tungus or Russian
316 hunters. A wealth of gold has lured numerous Russians into this
wasteland, too, especially in the area around the upper courses of
the left tributaries of the Amur. A locally very active gold in-
dustry has come into existence, which today is organized by the
state and which has drawn even this distant region into the economy.

● 133 The Ussuri country is divided into two completely different parts: the huge mountain mass of the Sikhote-Alin', which fills the entire area from the Bay of Peter the Great in the south to the mouth of the Amur in the north; and the Ussuri-Khanka lowlands, which extend west of the Sikhote-Alin' in the same direction and continue south of the Khanka Lake without marked interruption as far as the Bay of Peter the Great.

The Sikhote-Alin' is a forest-covered, strongly valleyed /zertaltes/ mountain mass, which is divided into several ridges running parallel to the coast. The shapes of the mountains are soft without especially marked edges and projections. More often plateau-like shapes predominate here, too. The heights in general lie between 650 and 850 meters; the valleys, however, are deeply carved out. Rising slowly from the west, the mountain mass descends steeply to the sea and only rarely leaves free a narrow coastal indentation plain on which there arises small, poverty-stricken fishing villages. The nearness of the sea crossed by a cold stream causes a cool, foggy, rainy, unfriendly summer, thus producing similar conditions to those found on the entire coast extending to the north beyond Okhotsk. Swampy valleys and forests dripping with a cool dampness and with a more northern stamp are typical marks of this area.

132 The western side of the Sikhote-Alin' and the Ussuri-
137 Khanka lowlands, on the other hand, correspond more to the Amur
country. Warm to hot summers joined with high rainfall and a

strong inclination to marshiness are distinguishing marks for this area. 132,
The Sikhote-Alin' stretching parallel to the coast keeps back the 137
coolness and also the fog from the sea and allows the sun to have a
stronger effect. Everywhere the more southerly position makes it-
self apparent. In the forests of Sikhote-Alin' deciduous trees appear
more and more in the foreground, increasing toward the south, until
finally, in magnificent specimens, they form the sole type of tree.
In the cultivated zone, too, which stretches along the entire lowlands, 311
typically Manchurian-Chinese plants become noticeable in increasing [241]
measure toward the south. Kaoliang and other millet, soya beans,
and rice appear noticeably on the scene. There is a change in the 162
population, too. In the northern part of the lowlands, as far as Khanka
Lake, Russians and Ukranians predominate; in the extreme south,
Chinese and Koreans are in the majority. The Ussuri-Khanka low-
land is relatively thickly settled, the Sikhote-Alin' itself, on the [316]
contrary, is in large areas as good as uninhabited, except for some
mining areas in the south, where /31/ coal primarily is mined.
Native Tungus traverse the Sikhote-Alin' in smaller numbers than in
the old days, and in addition there are Russian hunters and Chinese
collectors, who are looking for secret, legendary plants.

Sakhalin Island stretches over 950 kilometers in a meridional 131
direction. The southern part is traversed by two parallel mountain
ridges, which are separated from one another by a relatively wide
depression. The eastern mountain chain is shorter but higher, and
its peak of 2,013 meters is the highest elevation on the island. To-
ward the north the mountain ridges flatten out and give way to a
hilly plain. The cool, foggy air masses blow unhampered over the
land here, while in the south a difference in climate is caused by
the mountain chains. The eastern slopes are cool, rainy and un-
friendly, while the western side appears somewhat milder. The
southern parts of the island, which were Japanese from 1905 to 1945
and only now have again become Russian, are generally more favor-
able. In terms of its landscape, Sakhalin can be designated a damp,
cool, forested mountain country, but in numerous places treeless
moss steppes appear, which recall the tundras of the north. Once
feared as a Russian prisoners' colony, Sakhalin is advancing economical-
ly more and more because of its petroleum and coal resources.

The Okhotsk coastal area begins at the Uda Bay and encom- 133
passes, in a narrow coastal strip, the Sea of Okhotsk as far as Penzhina
Bay in the extreme northeast. In the western part, which stretches

●/133 from the Uda Bay approximately to the harbor of Okhotsk, the mountainous rampart of the Dzhugdzhur runs parallel to the coast, to which the mountain descends steeply and abruptly. Only seldom does a narrow coastal margin offer an opportunity for establishing a fishing settlement. The way from the coast into the interior of the land is extremely difficult, for only narrow river valleys, etched out like ravines, are available for this: these rivers hasten over their short course into the sea from the ridges of the mountain rampart. For this reason Ayan, the sole harbor on this coast, can't develop. Only near Okhotsk does the foreland broaden into a coastal plain and offer easier routes into the interior of the land. The eastern part of the coastal region from Okhotsk to Penzhina Bay is, on the other hand, very much broken up and has numerous peninsulas and off-shore islands. Here the spurs of various mountains run into the coast almost at right angles, and in between extended, gently rising valley areas extend into the interior. The manifoldness of the formations is increased more by a mountain chain which, running parallel to the coast, appears only in the peninsulas. In terms of its landscape the coastal area presents the same face everywhere. Thick forests cover 133 137 the slopes and fill the deeply cut-out valleys of the numerous rivers and brooks, most of which are short and which flow into the sea. On the higher tops and mountain ramparts, however, tree growth can no longer develop. Crippled shrubs or /32/ more often moss blankets cover these areas, while the highest projections, like bare gol'tsy, extend beyond the vegetation line.

From the northeastern end of Penzhina Bay a broad lowland extends to the northeast into the interior of the land and continues into the Anadyr' lowland, interrupted only by a narrow watershed-crossbar, which is at most 500 meters high. The Anadyr' lowland opens to the east on the Bering Sea. Both the Penzhina and also the Anadyr' lowlands are very much broken up by numerous mountain and hill ridges projecting into the lowlands. In terms of landscape they both have the same stamp. In the higher areas between rivers broad moss tundras cover the land. However, large poplar forests extend to the rivers, and these forests turn into fir-pine forests in the mountainous border areas beyond the upper courses of the rivers. In general one can consider the landscape to be a wooded tundra.

In the north the Anadyr' area is adjacent to the Chukchi 133 Peninsula. Although the peninsula's coasts are very well explored, its interior is still fairly unknown. Two rubble-covered mountain chains traverse it from west to east, and these mountain chains with 133● their spurs in part reach the coast, where they break off sharply. But this area also does not lack plains, for plains extend from the coast into the land on both sides of the rivers.

All these areas* are either very little settled or are completely 311 uninhabited. Of the Russian coastal settlements only Okhotsk and Magadan as harbors have a certain importance. Worthy of note is the reindeer breeding of the Chukchee on the peninsula named after them.

South of the Anadyr' lowland rises the Koryak Range, which 133 fills the entire area as far as Korff Bay. Some mountain ridges, only a little separated from one another, traverse the land in a wide arc from the southern end of the Anadyr' Bay in the direction of the Kamchatka Mountains. Only near the coast have the rivers dug out [137] deep valleys; here forest growth appears, while the high areas and the ridges are covered by pure tundra.

The coast of the Bering Sea has numerous native and Russian [361] fishing settlements; the hinterland, on the other hand, is occupied only by small Paleoasiatic remnant peoples, who pursue reindeer breeding.

Kamchatka Peninsula is one of the most interesting regions in the Soviet Russian Far East. The relief, which just like Sakhalin gets its main characteristics from two mountain ridges, is extraordinarily varied, for numerous young volcanos are set on the mountain ridges, and a number of these volcanos are still active. The Klyuchevskaya Sopka, the highest volcano on the peninsula, rises from the valley of the Kamchatka River to a height of 4,775 meters and makes an imposing picture with its ice-capped peak. Because 137 of the abundant rainfall and the mild climate, the plant covering of the peninsula is very luxurious. On the outer mountain slopes deciduous forests predominate, only /33/ in the interior of the peninsula do fir-pine forests appear. The only exception on a larger scale is the west coast, on which tundra-like moss steppes have developed. In addition 162 to numerous Russians who occupy primarily the coastal fishing villages, 361 the Paleoasiatic Koryak and Kamchadal have remained in the interior.

The volcano belt of Kamchatka continues toward the south in the island chain of the Kurils, which after World War II went to 133 the Soviet Union along with the southern half of Sakhalin Island.

* [i.e. the Okhotsk coastal area and the Anadyr' area -- Analyst]

Geological Structure and Morphological Formation

•/33 The geological history of the entire Far Eastern region is determined by the "Old Siberian Mass." The Angara country forms the core of this shield which was already rigid in the earth's early history. Around this old, early stiffened mass, resisting all orogenic movement, the earth's crust laid itself in broad fault zones, which, although with interruptions, belong to more recent periods the more distant they are from the old mass. Accordingly we see the most recent Tertiary mountain formations appearing only on the extreme rim on Sakhalin and Kamchatka. These folds have a second result of extreme importance for the morphology of the entire area: every younger orogeny, through its powerful tectonic pressure, destroys the older, already non-active fault and stiffened zone and leads to the formation of breaks and vertical displacements, and indeed often to over-extensions /Überschiebungen/ on the edges. Since in this regard every new fault exerts its effect internally toward the old mass, the result is that the degree of disturbance and breaking up of the old mountains into individuals masses, clods or horsts decreases toward the outside, and accordingly fault mountains have preserved themselves the best in the outer border zone. If individual details are overlooked, these large traits of geological structure appear throughout the land.

Transbaykal for the most part belongs to the oldest part of the continent, the "Old Summit of Asia," as Suess named it. Already in Pre-Cambrian times a mountain arose here with narrow, steep faults, which in the area discussed ran from southwest to northeast, i.e., in the direction which Lake Baykal runs. Strong wearing away lowered this mountain into a mountain root /Gebirgsrumpf/, almost a plain, which then later was broken up into individual parts by disjunctive movements, especially by breaks. The horst and graben formations produced thereby are of striking importance for the morphology and hydrography of the land. The mountain ridges which we encounter today in Transbaykal, are nothing but standing or elevated horsts, i.e., remainders of Pre-Cambrian mountain roots. In this the shield movements, which were repeated in several phases until Post- /34/ Tertiary times, have kept constant the strips in the line of Lake Baykal which have been predominant since Pre-Cambrian times. Marked by the old fault mountains, all tectonic lines extend from southwest to northeast. From this results long horsts and grabens, which can often be followed through all Transbaykal. Only seldom are they crossed by diagonal depressions and slight diagonal sills. Lake Baykal belongs to the most recent breaking-in of the region. It is certain that it already existed in the Miocene period, although its final formation took place only in the late Tertiary era through the elevation of its surroundings. Its basin consists of four grabens, of which three extend in the same direction as Lake Baykal, while the most southern one follows the course of the Sayan. The Sayan Range, which is faulted onto the southwestern border of the Angara Mass, shows in its oldest structure a construction similar to the old Baykal Mountains, but it is somewhat younger. It stretches from northwest to southeast and thus runs into the Lake Baykal direction almost at right angles. This direction of strips is generally designated as the Sayan direction. Only the spurs of the Sayan extend into Transbaykal. It is still not clear whether the Sayan direction bends here into the Baykal direction or whether the two, coming together here, run out toward the south.

In the horsts of Transbaykal there appear everywhere on the surface bare deep stones /Tiefengesteine/ of the primitive mountains, especially granite, syenite, gabbro, and in addition to these there are metamorphic rocks of Pre-Cambrian times, especially gneiss, crystalline slates, marble, and quarzite. These stones determine the predominantly soft morphological forms of the flat ridges, from which here and there individual cores project from the rounded tops. Where, however, effusion /Erguss/ stones, especially porphyry and porphyrite, have participated in the formation of the surface forms, the formation is more lively and more varied. The 2, 508 meter high Sokhondo in the area around the source of the Ingoda is from porphyry and its tufa and downright Alpine mountain forms full of valleys. Basalt extends over a larger area only in individual grabens, i.e., on the upper Vitim, in the Tugnuy trough, between the Tsagan-Daban and the Saganskii Mountains and in the Khilok graben. In general basalt effusions resulted. Only on the upper course of the Vitim do the eruptions in the Obruchev, Mushketov, and Lopatin volcanos have outspoken crater forms, which project from the surroundings, however, only about 100 to 160 meters.

Toward the northeast the internal horst region of Transbaykal turns gradually into highland-shaped formations. On the Vitim Plateau, the first representative of this region, whose high plain-like character is strengthened by the basalt covering laid over it, additional mountain ridges with similar surface forms are adjoined. In general the Transbaykal character is preserved. Here, too, Pre-Cambrian rocks form the base of the extended horsts. Wide grabens, however, are lacking. As a consequence, the results of the /35/ forces of water, ice, and wearing away by frost, forces whose shaping effects have occurred more recently, can be observed much more clearly. Typical are the deeply-etched valleys, which follow the break-lines but often likewise go their own way. Also the strips going in the Lake Baykal direction can be followed everywhere in spite of the high plain character. In the Patom Plateau, however, north of the lower course of the Vitim, this clear unequivocalness disappears. Probably the basic mass of the plateau consists overwhelmingly of metamorphic stone series of Pre-Cambrian times, and the main fault is Pre-Cambrian, but the lines stretching in the direction of Lake Baykal are lost here. In a sharp curve, convex toward the north, the fault turns to the east and east-southeast. The damming-up effect of the archaic Aldan mass makes itself noticeable; the Aldan mass like the Angara country, belongs to the core of the Siberian primeval shield. The faults extend along the southwest and southern border of the Aldan mass until they experience a strong demolition east of the Olekma in the zone of the Stanovoy Range.

The horsts of the high plain region mostly project more markedly than in the actual Transbaykal area. Generally they are between 1, 000 and 1, 500 meters high, and projecting above them up to more than 2, 300 meters are numerous mountain cores consisting predominantly of intrusive stones. Of economic importance is the fact that the old Proterozoic masses conceal numerous ore deposits. The richest gold mines in the USSR lie in the area of the Vitim and the Patom. Besides the gold-quartz veins still existing, gold is found in the permafrost diluvia metals and sands of the river valleys, however, mostly secondarily.

The system of the Stanovoy Range begins east of the Olekma and north of the mouth of its tributary the Nyukzha. This mountain range forms the southern Proterozoic border of the Aldan mass and because of the resistance of the latter, this mountain range forms the continuation of the Transbaykal root plain, bending somewhat toward the south. Stretching out in many places are the old faults which form the trunk, but these faults extend from southeast to northwest so that the tectonic and orographic stretches /Streichen/ do not always coincide. A similar stretch of Pre-Cambrian faults from southeast to northwest can also be seen in the area around the upper course of the Olekma in the north of the large Amur arc. Also the trough points to tectonic tendencies in the same direction, as does the course of the middle Vitim. The coming into being of the Stanovoy Mountains was therefore completed in part independently of the direction of the old faults and goes back to later breaks with horst and graben formations; in this the abutment of the Aldan mass became decisive for the present orographic stretches /Streichen/ of the system, which extends from west to east in an arc which is slightly convex toward the south. In connection with the breaks there has also been the thrusts of eruption stones which extend especially on the northern border and which have caused steep mountain forms to come into being locally. The real ridges have a high plain character and generally lie 1,200 meters above sea level. The highest point, north of the /36/ source of the Zeya, attains a height of 2,482 meters. Typical of a large part of the Stanovoy Range is a sloping to the south in gentle steps.

The Stanovoy Mountains extend to the east as far as the Maya, a tributary of the Uda. To the east they adjoin the Dzhugdzhur Mountains, which extend to the northeast as far as the Okhota River on the coast of the Sea of Okhotsk. They are the main chain of three parallel mountain chains, and consist primarily of gneiss, granite, and porphyry. But they also have slate and limestone folded in, whose fauna belong to the upper Devonian era. This brings with it the variegated /variscische/ formation of the Dzhugdzhur, which undoubtedly is adjoined in the west to the older zones, which form the eastern border of the Aldan massif.

Mesozoic fault zones, extending to the Sea of Japan, adjoin on the south and southeast the block of the Pre-Cambrian faulted area in Transbaykal and of the Stanovoy, a block which seems to be a single unit. In individual regions these zones are unevenly developed and are also preserved unequally. Because of the fact that knowledge of this land is still slight, many tectonic movements still can't be ordered in time or limited, and only a general, over-all description can be given.

Following the Pre-Cambrian region is a broad zone of Caledonic and variegated /variscische/ faults, which extend from Mongolia to the Sea of Okhotsk and follow the strip direction of the older zone. The eastern parts, including the middle Amur region, into which the Triassic and Jurassic Sea was able to penetrate, belong to the Cimmerian Orogeny, which probably can be regarded as the most powerful in the Far Eastern region. It penetrates far into the interior and overpowers

•133 the preceding older formations more or less strongly, dismembering them into clods /maybe: shields/ and causing rises and depressions. Toward the outside the Cimmerian zone is displaced by the Tertiary, alpidic orogeny. Sakhalin, Kamchata, and the Koryak Mountain Range, which is surrounded by the Penzhina-Anadyr' depression, are considered as belonging to this orogeny. On the continent in the Amur area the Tertiary events produced bends and clod movements.

In the southeastern part of Transbaykal the horst character predominates as it does in the rest of Transbaykal, but the typical graben formation recedes, and the individual mountain ridges are mostly formed by simple dislocations. The stronger tectonic processing of this region goes back to the Mesozoic orogeny which already appears here. The Cimmerian mountain formation dominates incontrovertibly in the Shilka Hills northeast of Nerchinsk. Also further to the south in the Nerchinsk Mountain Range north and east of the Borzya railroad station, there are pre-Jurassic and post-Jurassic faults with northeastern lines, and on the upper course of the Ingoda old northwestern faults appear, which lie under a more recent fault following the line of Lake Baykal. The border of the old Lake Baykal root plain, which was no longer incorporated by the Mesozoic /37/ orogeny, must be sought west of the Nerchinsk-Borzya line.

The Yablonovyy Ridge, which in its entire course belongs to the Pre-Cambrian horst region, extends south of the upper course of the Vitim and its tributary the Kalakan in a northeasterly direction almost as far as the Olekma. North of the end of this ridge individual mountain tops in the Kalar Mountain Range reach considerable heights (Golets Skalistyy 2, 800 meters; Golets Snezhnyy 2, 515 meters). These regions, to which the Olekminsk Stanovik in the area around the upper Olekma also belongs, are still incompletely explored. Brief mention can be made of this latter area.

The Stanovoy Range declines toward the south into the upper Zeya Plain, which continues toward the west in the Gilyuy Valley at the foot of this mountain range. This valley is a large graben depression, which is filled with gold-bearing river beds. Its center is 329 meters deep. On the south the depression is closed off by a long mountain chain, which runs from west to east analagous to the Stanovoy. This is the Tukuringra-Dzhagdy Mountain Range. The Yankan Ridge acts as the connecting link to the west with the Olekminsk Stanovik. The entire mountain chain consists primarily of gneiss, granite and crystalline slates. However, it has been con-

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firmed that Paleozoic elements are included in the fault, and accordingly the Pre-Cambrian age assumed earlier probably does not apply to the entire chain. Local break lines traverse the mountain mass and follow it especially at the southern foot. The wave-like upper surface is heavily eroded, and projecting beyond it to heights up to 1, 600 meters are numerous tops of mountain cores. The height of the central pass is between 900 and 1, 000 meters. The Tukuringra Mountain Range is bored through on the south by the Zeya River, the sole drain from the closed-off graben depression, which is named after it /i.e. Zeya/. Terrace formations point to more recent vertical movements. From the River Dep, a left tributary of the lower Zeya, the mountain chain bears the name Dzhagdy Mountain Range. It is connected with the Stanovoy by a broad, high ridge, which cuts off the upper Zeya Plain on the east; generally in the Dzhagdy Mountains the two main strip directions to the northwest and the northeast are manifest and cause the winding course of this mountain range. Its ridge forms the watershed between the Uda, flowing into the Sea of Okhotsk and the Selemdzha belonging to the river area of the Zeya. The region of the source of the Selemdzha is surrounded almost concentrically by high mountain ridges, which form the northern part of the Bureya Mountain country.

The Bureya Mountain country comprises the entire region of the river of that name, and in addition sends out spurs to the lower Amur and the Amgun'. In it the strip direction toward the northeast is again clearly manifest both in the Turan Ridge west of the river and especially also in the Bureya Mountain Range, the backbone of the entire mountain country. The Bureya Mountain Range is a continuation of the Lesser Khingan lying in the Manchurian area, and is therefore often also designated by the same name in Russian territory. The Amur cuts through /38/ the mountain chain in a more then 150 kilometer long valley, which is often scarcely one kilometer wide and which is lined by high rocky banks. Here on the Amur, the Bureya Mountain Range is only 200 to 500 meters high, but it rises toward the north, where between the area around the source of of the Selemdzha and that of the Bureya it has the greatest elevations in the area with heights of 2, 155 and 2, 119 meters. Here parts of the mountain chain also have special names locally, for example the Duse-Alin, which surrounds the source area of the Bureya, and the Yam-Alin, which is up to 2, 000 meters high. In addition to the gneiss, grantite, and metamorphic slates, there are extensive deposits

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of porphyry and diabase, and in the south Jurassic sediment especially. The valley of the Bureya has extensive deposits of strongly dislocated Jurassic hard coal. The ridges often have the character of greatly cut up high plains.

The wide plain on the middle Amur is divided into two parts by the lower course of the Zeya. West of the Zeya stretches the Amur-Zeya Plateau, to the east is the Zeya-Bureya lowland. The first is a high plain, which generally lies 250 meters high and consists of flatly laid out Jura and brown coal-bearing Tertiary; this high plain bends gently from northwest to southwest. The watershed areas are very flat; the valleys, on the other hand, are deeply etched. On the steep banks of the Zeya the Tertiary, reckoned from the river bed, has a thickness of 150 meters. Therein appears in many places granite, gneiss, and, in some places, porphyry, melaphyre, and basalt. The area between the Zeya and the Bureya is higher in the north and has here a hilly terrain. On the left side of the Zeya and along the Amur extending beyond the mouth of the Bureya to the east is a pronounced lowland, which is principally filled with recent Tertiary deposits. In open lodes of individual hills, however, old stones appear, too. The entire region of the middle Amur owes its present form to an incurvation in large waves of the root plain in the Tertiary period. However, still later vertical movements occurred, too, as is indicated by four clearly formed terraces both on the Zeya and also on the Amur. The highest lies 100 to 120 meters above the present level of the lower course of the Zeya.

The region around the lower Amur, which begins at Khabarovsk, can be regarded as a long graben depression between the Lesser Khingan and the Bureya Mountains on the one side and the Sikhote-Alin' on the other. The region north of the lower Amur which has still been but little explored is very much broken up. Here, too, the faults stretch predominantly toward the northeast as in the Bureya Mountain country, but the disturbance of the structures, which go back to two variegated phases following one another, is extraordinarily great. The bays south of the Shantar Islands can be regarded as graben break-ins, while the islands themselves, which are formed from slate and granite, are remaining horsts.

Actually the lower course of the Amur, comes very close to the sea with its Kizi and Kada lakes. But after a turn to the north, it takes in the Amgun, making a sharp /39/ turn to the east, where it empties into the sea. This phenomenon can be explained by

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andesite and basalt overflows, resulting here from the formation of the Sikhote-Alin' and by later crust movements.

The Sikhote-Alin' is a mountain block surrounded on all sides by breaks. Only in the south is there a covering formation. The main fault with overextensions toward the northwest occurs in the Lower Cretaceous /Unterkreide/. The faults stretch toward the northeast to east-northeast. Steep breaks occurring later have cut up both the Sikhote-Alin' and also the Ussuri country and led to rises and depressions. The main break lines follow the lines of the mountain faults. Thus the Ussuri depression came into being as a break-in. The coast, too, came into being through a breaking-off. In the north, opposite Sakhalin, however, the coastal break line bends toward the north and converges here with the lines of the faults. In the south the Sikhote-Alin' ends with a cross break. The following facts on stone composition are of greatest importance for the present surface forms. In the central and also the border sections, granite predominantly forms the oldest layers. It appears in the old surfaces and in the lower slopes as a pronounced massif, while the flanks mostly are covered by younger, heavily faulted and destroyed stones--in the west predominantly by crystalline slates, gneiss, micaschist, and quartzite; in the central part predominantly by phyllite, argillaceous schist, silicious schist, and sandstone. Of the effusion /Erguss/ stones, porphyry as a rule forms the numerous round tops, while basalt is represented in the extended cover effusions. The southern part of the Sikhote-Alin' is differentiated from the northern by the appearance of overextension covers /Überschiebungsdecken/. In numerous places, especially on high mountains, marbled limestone of Permo-carboniferous age, forming thick layers, lies in the form of individual clods. Also the northwestern topplings over of Jurassic and Triassic point to over-extensions /Uberschiebungen/. These must have occurred in the period between the upper Jurassic and the Miocene and have come from the direction of the Sea of Japan. The surface forms are predominantly of a single form. Long, vallied ridges with tops set over them, and winding, unequally formed valleys, often with convex slopes, are characteristic. In the basalt coverings the rivers have dug deep, canyon-like valleys. Of significance for the newer relief formation are the vertical movements, begun in the Diluvia age but still not completed at present. Broad abrasion terraces lie near Vladivostok reaching heights of 10, 30, 50, 120 meters and, in individual places, up to 300 meters. At present

/33 the southern coast is sinking while the east coast apparently is rising. A consequence of the old and late Diluvia elevation is the crooked position of the entire Sikhote-Alin' block with its inclination toward the interior of the land.

The alpidic fault zone is limited to the extreme outer areas and is retained only in fragments. From there arise indications of two large fault arcs. The western one appears on /40/ Sakhalin and reappears apparently on the northern coast of the Sea of Okhotsk in the Chutkavar Hills west of Magadan and on the Koni, P'yagina and Taygonos Peninsulas, to circumscribe the Penzhina depression on the west and the Anadyr' lowland on the north in a swinging arc. Kamchatka, along with the Koryak Mountain Range adjoining it on the northeast, forms the core of the second arc, while the Kuril arc is a continuation toward the south to the Japanese Islands, where the two fault arcs come together on Yesso Island. The western arc is distinguished from the eastern one by the lack of active volcanos, which distinguish Kamchatka and the Kurils especially.

On Sakhalin continental formations alternate frequently in the sediments of the Upper Cretaceous /Oberkreide/ and thus indicate that the island is located on the border of a geosyncline. The two mountain chains, which are separated by the long Tym and Poronay depressions filled with marine recent Tertiary, differ substantially from one another. The eastern mountain range projects up to 2, 013 meters and shows break and shield formations in addition to an older, probably variegated /variscischen/ fault with heavy intrusions. The western mountain on the other hand consists only of more recent rocks, especially Upper Cretaceous and Old Tertiary. The Tertiary fault stretching meridionally repeats, therefore, the variegated /variscische/ direction visible in the eastern range. The faulting is irregular in individual places and decreases toward the north. Of the three Tertiary phases which are distinguished, the youngest is expressed predominantly in long breaks with effusions both on the west and on the east coasts. The vertical movements appearing with these have lasted up to the present. In this the northern tip of the island is sinking, while in the middle of the island marine Quarternary has risen up to 150 meters and five beach terraces are visible on the banks.

The structure of Kamchatka is similar to that of Sakhalin. A break-in zone running approximately toward the north-northeast, and containing the Kamchatka River which flows from the south and the

Yelovka which comes from the north to meet the Kamchatka, divides two mountain chains, which run parallel toward the north-northeast in the same direction. Also on Kamchatka, in the eastern part, there are remains of an old Caledonic or variegated /variscischen/ zone, whose faults, however, extend toward the northwest and meet the Tertiary faults at right angles; this, as well as other causes, explains the destruction which is so pronounced even for the east. The western range is a 1, 000 to 1, 200 meter high middle mountain range. Basically it consists of crystalline slate and phyllite, on which sandstone and slate, presumably of Paleozoic age, are deposited, and of Upper Cretaceous and Tertiary from Oligocene to Pliocene with heavy effusions, which are faulted several times with north-northeast strips and overextensions toward the southeast. West of this mountain chain stretches a cut-up coastal table, elevated to 600-750 meters and consisting of dislocated marine Pliocene deposits, partly also of Upper Cretaceous; this coastal table slopes to the Sea of Okhotsk /41/ in several beach terraces. This coastal zone, too, appears to lie in gentle waves and is broken through by isolated elevations consisting of eruptive rock. The western chain conceals numerous extinguished and heavily destroyed volcano ruins. In the center rises the 3, 607 meter high Ichinskaya Sopka with its mighty dome and some sloping glaciers. It is the only active volcano in the western half of Kamchatka, and its crater constantly expels clouds of smoke. In contrast to the straight, elevated west coast, the east side of Kamchatka is much broken up by numerous break-in basin-shaped valleys. The eastern mountain range is very heavily destroyed, in many places overlaid by volcanic masses; and therefore only fragments of the original structure are visible. Granite and crystalline slates are indicated here as Proterozoic. The tectonic action /Durcharbeitung/ is so strong that even the Pliocene is shoved over /überschoben/. Connected with this destruction are the especially heavy volcanic formations on the eastern side of the peninsula, and in this the eruptions as a rule follow the great breaks, which run perpendicular to the faulting. Of the 127 known volcanos, 74 are recent volcanic formations, and of these 18 are still active today. The most important is the immense, regular andesite basin-shaped cone of the Klyuchevskaya Sopka which has a height of 4, 775 meters and is covered down to 1, 500 meters with perpetual snow and glaciers. The Commander Islands also have recent volcanos. Tertiary is also found on them.

Kamchatka Peninsula is connected with the mainland on the north only by a narrow plateau which is up to 155 meters high, the Parapolskii-Dol, which was elevated only in recent times. North of this narrows stretches the Koryak Mountain Range, which really is a broad zone and which with its mountain ridges continues the faults of Kamchatka in the same direction. The three known main chains, the Palpal, the Tingeney, and the Rarytkin, consist, according to knowledge to date, of Cretaceous and Tertiary deposits with basalt eruptions. The present formation of the area appears to go back more to more recent clod /Schollen; maybe, shield/ movements, which were their strongest in the Diluvia and which gave rise to dispersals and even block overextensions /Blocküberschiebungen/. Elevation dominates on the coast today, too, and on this elevation two elevated beach terraces can be observed. However, the entire area of the Koryak Mountain Range is among those little explored areas, and accordingly further clarification must await the future.

The Kuril arc adjoins the southern tip Kamchatka. Twenty-three islands have volcanos, of which 18 are still active.

Knowledge of the Anadyr' region and of the Chukchi Peninsula is still very slight. Only the coastal areas are better explored. The line of the mountain chains appears to be varying and is influenced by an older core of the "Chukchi Mass" lying in the north; around this mass the mountain chains order themselves in a similar fashion to the way they do around the old Angara mass. /42/ Thus a main fault line stretches approximately from west to east through the Chukchi Peninsula, and this line apparently consists of two chains. Also further south, in the Kolyma area, the chains fit into this order with a line from southeast to northwest. In time these orogenies belong to the Mesozoic.

The Ice Age and Its Traces

Most of Transbaykal and the Far East was spared the Quarternary glaciation. The nearness of the Central Asiatic heights with land air currents in the winter and with resulting slight rainfall in the cold season may have contributed significantly to this in wide areas of the country, while in others the southern position can be assumed to be an additional reason. Where glaciation was able to form, special local conditions must have led to this, but research still cannot give a final judgment on the reasons for these special conditions. Only three sections were gripped by the glaciation in large measure: the extreme northeast, Kamchatka Peninsula, and the area east and northeast of Lake Baykal. Even in these regions the extent of the glaciation was limited mostly to the mountains and the higher parts of the land, while lower plains remained free of ice; accordingly the glaciation--even though in spots it may have extended over quite a large area--had only a local character here, which cannot be compared with the mighty ice-covering which Europe experienced.

The glaciation of the extreme northeast is related to the similar occurrence in all of northeastern Siberia, and together these glaciations form an entire complex of ice-covered mountains and of ice-free plateaus and plains lying in between the mountains. The area of glaciation extends over the entire area from the lower course of the Lena in the west to the Chukchi Peninsula in the east. The glaciation of this region stands in contrast to the conditions in central Siberia, which remained ice-free for the most part. The next glaciation area is far west of the lower course of the Lena in the river valley of the Khatanga. Thus the northeast Siberian glaciation area forms a specific unit in which the same conditions are predominant. In order now not to remove the areas belonging to the Far Eastern region from this context, since they, of course, constitute only a part of northeastern Siberia, we must be permitted to go into detail on the Ice Age conditions in the entire area in order to get a better survey. But here, too, the limitation must be made that, because of the still inexact investigation, exact details can be given only for individual areas, while in the rest we must be satisfied with a general picture. In this connection mention may be made /43/ /Map of Glaciation in Northeastern Siberia:/ /44/of the author's essay, "Die Eiszeit in Sibirien" in the periodical Erdkunde /Earth Science/ (Bonn 1951, Vol. V).

The glaciation east of the Lena sets in with the arc of Verkhoyansk Mountain Range. This begins in the north with the 1,200-1,300 meter high Kharaulakhskiy Mountain (Kharaulakhskiye Gory), whose spurs extend into the Lena Delta. There is still not general agreement whether or not this mountain experienced glaciation. Some researchers, such as Parkhomenko (149) and Saks (170)

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149. Parkhomenko, S.G. Nekotorye dannye o prirode Nizhnelenskogo kraya /Some Statements on the Nature

Map of Glaciation in Northeastern Siberia:

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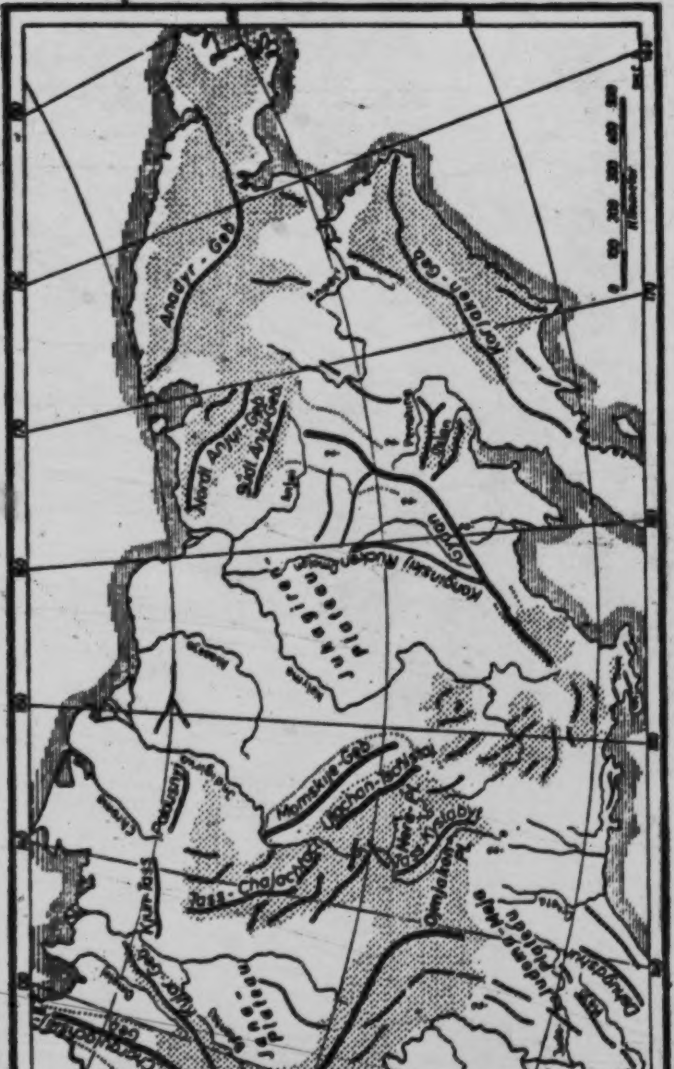
Anadyr - Geb.
Korjaken-Geb.
Nördl. Anjui-Geb.
Südl. Anjui-Geb.
Gydan
Jukagir Plateau
Momskije-Geb.
Ulachan-Bohdoi
Tass-Chajachtach
Tas-Kystabyt
Omjakon Pl.
Kular-Geb.
Jana Plateau
Judoma-Maja Plateau
Dshugdshur
Druigdi

The dotted areas give a survey of the glaciated regions. Since--apart from the area between the mouth of the Kolyma and the Chukchi coast and the Koryak Peninsula--the glaciation is of the Alpine type, the area appears disproportionately large. The picture is unclear on the mountain ranges outlined by dotted lines.

/43/

of the Lower Lena Area/. Trudy of the Commission for Research on Yakutia, 1928.

170. Saks, V.N. "O chetvertichnom oledenenii severa Sibiri /On the Quarternary Glaciation of Northern Siberia/," Arktika, Vol. IV, 1936.

answer this question with a yes, while others, such as Romanov (160)

160. Prasolov, L.I. Iuzhnoie Zabaikal'ye /Southern Transbaykal/. Material for Ground Research in Asiatic Russia. Moscow, 1927.

and Vollosovich answer this question with a no, although even today the mountain still has ice caps. There is no question about the Orulgan Mountain Range, which extends up to 2,000 meters in height and which adjoins the Verkhoyansk on the south. The Orulgan has incontrovertible signs of an extensive valley glaciation (84). The glaciers

84. Ivanov, A.P. "Novye dannye o geologicheskom stroenii i polesnykh iskopaemykh Orulganskogo khrebta /New Information on the Geological Structure and the Natural Resources in the Orulgan Area/," Problemy Arktiki, No. 4, 1938.

rose from the valleys toward the west where they joined with a foreland glaciation and almost reach the line of the present Lena. On the east they extend as far as the Bytantay, a left tributary of the Yana (170).

170. Saks, V.N. "O chetvertichnom oledenienii severa Sibiri /On the Quarternary Glaciation of Northern Siberia/," Arktika, Vol. IV, 1936.

The Kular Mountain Range, stretching on the left side of the Bytantay from the Orulgan toward the northeast to the lower Yana, has also undergone glaciation, according to Saks. The real Verkhoyansk Mountain Range, which begins in the area around the source of the Bytantay, has heights up to 2,000 meters in the west and toward the southeast rises to heights up to 2,500 meters. It experienced a similar glaciation to that of the Orulgan Range. Here, too, valley glaciation predominantes, but it was stronger and more extensive than that of the Orulgan. The glacier appeared toward the southwest and south and, as a closed foreland glaciation, moved as far as the Lena and the Aldan. Its extreme edge reached a distance of up to 200 kilometers from the foot of the mountain range and descended to an absolute height of 2,000 meters. (74, 137). At the time of its greatest expansion it reached the Okhotsk tract at the passage over the Aldan. Traces of an old glaciation are, according to Saks, also found in the Dzhugdzhur, which stretches along the coast of the Sea of Okhotsk. However, here there is still no exact information on the extent or the type of the glaciation.

74. Gregoriev, A. A. Geologiia, relief i pochvy severo-Zapadnoi chasti Lensko-Aldanskogo plato i Verkhoianskogo khrebta po dannym ekspeditsii 1925 g. /Geology, Relief, and Ground of the Northwestern Part of the Lena-Aldan Plateau and of the Verkhoyansk Mountain Range according to the Information of the 1925 Expedition/. Material of the Commission for the Study of Yakutia No. 4, 1926.

137. Obruchev, S.V. Kolymsko-Indigirskiy Kray /The Kolyma-Indigirka Region/ Trudy SOPS, Yakutia Series 1, 1931.

The extent of the Verkhoyansk Glacier to the north is still too unevenly investigated to permit final conclusions. Khmysnikov (45) found no moraines on the Yana Highland (Yanskoye Ploskogorye). Better known is the southeastern part, the area around the upper course of the Indigirka. Here between the Verkhoyansk Mountain Range and the chains of the Cherskiy Range lie two highlands, the Oymyakon Plateau (the area around the source of the Indigirka) in the south and in the north the Nera Plateau (Nerskoye Plateau, drained from the Nera to the Indigirka); these two plateaus are separated from one another by the Tas-Kystabyt Mountain Range. The Cherskiy Range, which apart from Kamchatka has the highest elevations in northeastern Siberia (the Gora Chen is 3,114 meters high), has a mighty ice covering,

45. Khmysnikov, P.K. Geomorfologicheskii ocherk Lensko-Yanskogo Kraya /Geomorphological Sketch of the Lena-Yana Area/. Trudy SOPS, Yakutia Series 1, 1932.

● 133 which, accroding to S.V. Obruchev (137), has the character of an

137. Obruchev, S.V. Kolymsko-Indigirskiy Kray /The Kolyma-Indigirka Region/. Trudy SOPS, Yakutia Series 1, 1931.

inland glaciation. The glacial mass overflows the Nera Plateau (down to heights of 1,000 to 1,299 meters), the /45/ Tas-Kystabyt Mountain Range, which in addition, through its own glacial formation, contributes to raising the entire mass of the ice, and the Oymyakon Plateau (down to heights of 1,500 meters). Here the glacial mass meets with the glaciers flowing toward the north from the Verkhoyansk Range. The entire area between the two main mountain chains has thereby a closed ice covering. The glacial mass on the Oymyakon Plateau is 400 meters thick, according to S.V. Obruchev. (137)

137. Obruchev, S.V. Kolymsko-Indigirskiy Kray /The Kolyma-Indigirka Region/. Trudy SOPS, Yakutia Series 1, 1931.

Peculiarly enough the very significant glaciation of the Cherskiy Mountain Range developed only slightly toward the north; the ice masses moving in that direction did not once reach the Momskiye Mountain Range running parallel to the Cherskiy (the river valley of the Moma separates the two mountain ranges). The Cherskiy Range, whose highest elevations project more than 2,000 meters, is supposed, in the opinion of some researchers, not to have been glaciated more, but this is contested by others. Thus, the question of the glaciation of the Momskiye Range still remains unanswered. The Cherskiy Range even today still has glaciers, whose extent, however, it has not been possible to determine up to now. Further north between the Yana and the Indigirka, glaciation of the Tas-Khayakhtakh is still known, and from this range glaciers pressed forward as far as the Indigirka (approximately 68° North). The extreme north, however--the Polousnyy Range--is, according to the newest information, no longer supposed to be covered with ice, despite its height of up to 1,200 meters. (170)

170. Saks, V.N. "O chetvertichnom oledenienii severa Sibiri /On the Quarternary Glaciation of Northern Siberia/," Arktika, Vol. IV, 1936.

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The mountain chains in the area around the upper course of the Kolyma show numerous and clear glacial traces (the Garmytshan, Arga Tas, and other ranges), but these traces never lie below 500 meters above sea level, and accordingly only a more local glaciation can be assumed for this area. Also the Kolyma Plateau, adjoining it on the north, has only individual local glaciation centers, which extend over slight areas. More detailed information on these regions is not available.

Between the upper entrance area of the Kolyma and the coast of the Sea of Okhotsk, and also in the southern part of the Gydan Mountain Range (also often known as the Kolyma Mountain Range), the glaciation was again greater and attained here the closed form of an ice covering. This occurred especially on the slopes inclined toward the Sea of Okhotsk; these slopes were covered by an extensive glacial mass, which at the time of its greatest size was of the Norwegian type. From the heights of the Gydan /also: Kolyma/ Ridge (2,000 meters) the glacier descended as far as the coast of the Sea of Okhotsk (74, 137). Full glaciation is assumed for the northern Gydan lying in the interior of the country, and this glaciation continued then as far as the Chukchi Peninsula.

In contrast to the relatively heavy glaciation of the mountain ranges, the plains lying inside the arc of the Verkhoyansk and Gydan Ranges were free from every form of ice covering. This applies both to the higher plateaus and also to the coastal plains and the hinterland, areas which morphologically consist of very different units: the depression /46/ of the Omoloy, the Yana, Indigirka, and Kolyma, the Alazeya Plateau (descending to heights of 200-700 meters) on the

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74. Gregoriev, A. A. Geologiia, relief i pochvy severo-Zapadnoi chasti Lensko-Aldanskogo plato i Verkhoianskogo khrebta po dannym ekspeditsii. 1925. /Geology, Relief, and Ground of the Northwestern Part of the Lena-Aldan Plateau and of the Verkhoyansk Mountain Range according to the Information of the 1925 Expedition/. Material of the Commission for the Study of Yakutia, No. 4, 1926.

137. Obruchev, S.V. Kolymsko-Indigirskiy Kray /The Kolyma-Indigirka Region/. Trudy SOPS, Yakutia Series 1, 1931.

●133 eastern side of the Indigirka, the Yukagir Plateau east of the Kolyma (Yukagirskoye Ploskogorye, 300-400 meters high with local elevations of 1,000-1,200 meters). Within these regions older (Vollosovich) and also newer explorations, such as those of S. V. Obruchev (74) and

74. Gregoriev, A. A. Geologiia, relief i pochvy severo-Zapadnoi chasti Lensko-Aldanskogo plato i Verkhoianskogo khrebta po dannym ekspeditsii 1925 g. /Geology, Relief, and Ground of the Northwestern Part of the Lena-Aldan Plateau and of the Verkhoyansk Mountain Range according to the Information of the 1925 Expedition/. Material of the Commission for the Study of Yakutia, No. 4, 1926.

Vakar (224) have found no traces of glaciation. Vollosovich only found

224. Vakar, V. A. Geologicheskie issledovaniia v basseine reki Berezovki /Geological Research in the Berezovka Basin/ Isvestiia of the Geographical Society No. 65, 1931.

sand in the river valley of the Omolon, a right tributary of the Kolyma, which he indicated as fluvioglacial, and shifting rocks, which could, however, have also been transported here by river ice. This slight finding certainly admits of the possibility.

According to knowledge to date, the area between the lower Kolyma and the Chukchi Peninsula is regarded as having been fully glaciated. The indicated of this lies in numerous reports: but the character of the glaciation is not clear. S. V. Obruchev (136) is of

136. Obruchev, S. V. Drevnie oledenenile i chetvertichnaia istoriia Chukotskogo okruga /Old Glaciations and Quarternary History of the Chukchi Okrug/. Isvestiia of the Academy of Science, 1939.

the opinion that the ice covering was not everywhere closed. The main carriers of the glaciation were the northern Anyuy Mountain Range, in the main section the Anadyr' Range in the west and the ridges of the Chukchi Peninsula in the east. The borders of the entire glaciated area have still not been determined in detail. But there are numerous reports that the glacier in places extended to the coast, thus, for example, on the Chaun Bay in the north, on Cape Chaplin, and in the Provideniya in the east. Toward the south in the direction of the Anadyr' depression the glacier crossed the foot of the mountains only in slight measure. From the northern Anyuy Range the glaciation zone continues toward the south to the Gydan /also: Kolyma/ Range, but information on the borders of the glacier in this direction is lacking. As Saks (170) reports, more recent research has been made in the area of this glacial region and also on the Chukchi Peninsula, but this research has not yet been published.

The glaciation of the Koryak Peninsula was almost as extensive and as closed off as that in the north. The starting point for the ice masses was the 1,300-2,200 meter high Koryak Mountain Range, and from here the ice masses flowed in a broad front to the sea. In the process they not only covered over the slope gently inclined toward the southeast, but in parts they even reached the coastline. In contrast to the ice flow in this direction, the ice flow toward the northwest to the lowlands of the Anadyr' and the Penzhina was slight.

Apart from the northern and southern edges, the Anadyr' Lowland is itself free of all traces of a glaciation, as Polevoi (155), Soszawa (195), and S.V. Obruchev (136) have determined. Glacial traces are also very rare in the western hinterland between the upper course of the Anadyr' and the Penzhina. Here they appear only in places in the mountain ridges and then only from a height of 1,000 meters. Also the transition area from the Anadyr' Lowland to Penzhina

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170. Saks, V.N. "O chetvertichnom oledenenii severa Sibiri /On the Quarternary Glaciation of Northern Siberia/," Arktika, Vol. IV, 1936.

155. Polevoi, P.I. Anadyrskii krai /Anadyr' Kray/. Trudy of the Geological Commission, 1915.

195. Soszawa, V. "Das Anadyrgebiet," Zeitschrift der Gesellschaft für Erdkunde /Journal of the Geological Society/, Berlin, 1930.

136. Obruchev, S.V. Drevnie oledeneniie i chetvertichnaia istoriia Chukotskogo okruga /Old Glaciations and Quarternary History of the Chukchi Okrug/. Isvestiia of the Academy of Science, 1939.

Bay has experienced no glaciation. However the mountain ranges north of Penzhina Bay (Kamennyy and Ichigemskiy Ranges) have housed glaciers, as is indicated by the glacial deposits on the Oklan, a right tributary of the /47/ Penzhina. Individual glaciers have even pushed as far as the Penzhina itself and have borne ahead shifting rocks as far as the neighborhood of the mouth of the Penzhina.

The Anadyr' Lowland was separated from the basin of the Kolyma in the Ice Age, undoubtedly by heavy mountain glaciations, just as the basin of the Kolyma was isolated from the Yana and the Indigirka. In this connection the Anadyr' Lowland played a special role as a place of refuge for the Arctic plant world. Here the plant world could preserve itself in order to re-occupy the land as it became free after the disappearance of the ice. Tolmachev (217, 218) and the Swede Hultén (81) have devoted detailed investigations to these questions. Hultén has determined that similar conditions to those in the Anadyr' Lowland must have prevailed on the side of Alaska lying opposite this area. On the basis of the similarity of the plants and the type of their diffusion around and on both sides of the Bering Sea, he comes to the conclusion that a land connection between the two continents must have existed during the Ice Age. Now Antevs and Daly (48) have reckoned the the eustatic depression of the surface of the water for the maximum glaciation at 90-100 meters. According to the present depth relationships in the area of the Bering Strait, a lowering of the sea level by

217. Tolmachev, A.I. O proiskhozhdenii tundrogo landshafta /On the Origin of the Tundra Landscape/. Priroda, 1927.

218. Tolmachev, A.I. Flora tsentral'noi chasti Vostochnogo Taimyra /Flora of the Central Parts of the Eastern Part of the Taimyr Peninsula/. Trudy of the Polar Commission, No. 8, 1932.

81. Hultén, E. Outline of the History of the Arctic and Boreal Biota during the Quarternary Period. Stockholm, 1937.

48. Daly, R.A. "Pleistocene Changes of Level," American Journal of Science, Series 5, Vol. 10, 1925.

50 meters would have caused the formation of a land bridge 300 kilometers wide, and a lowering by 100 meters would have caused the formation of one 1,200 kilometers wide. Hultén asserts on the basis of his plant-geographic investigations that a land bridge at least 1,200 kilometers wide must have existed.

With the existence of such a wide land bridge the climatic conditions in "Beringia," as Hultén names this combined land connection, must have been essentially different from what they are today. The southern coast of Beringia was washed by the warm water of the Pacific. The moderating influence of this pressed toward the north and made itself felt at least in the lower regions in the south of the Chukchi and Alaska Peninsulas. Only thus can an explanation be found for the fact that in the lowlands of the Anadyr' and Penzhina, surrounded by glaciated mountains, relics of a Tertiary flora have remained even up to the present, and there are even wood types, such as the Chosenia macropolis and Betula cajandri.

Since in the formation and preservation of the land connection between the two continents isostatic forces could have had their effects then and long afterward, the possibility cannot be rejected that the land bridge could also have existed for a certain time in the Post-glacial period. The marine Quarternary at the Bering Strait is indicated as a deposit of an inner basin. In the Anadyr' basin the marine transgression was a very late one; it consists exclusively of recent forms of superior preservation and is obviously very young. These determinations point to a late appearance of the sea. /48/ With the recognition of a continued existence of the land bridge in a Post-glacial time an acceptable solution would be found for the question of the immigration of people from Asia to America, even though exact proof must be left for the future.

On Kamchatka the high volcano basin-shaped gorges (Klyuchevskaya Sopka 4,775 meters, Sopka Tolbachin 3,682 meters, Koryatskaya Sopka 3,457 meters, and others) are even today covered by glaciers, which extend down to a height of 1,200 meters. Numerous indications of an old glaciation are known especially on the southeastern coast. In Avacha Bay near the city of Petropavlovsk a developed trough valley formed by a more than 50 kilometer long glacier has been determined, which almost reaches the sea coast. At the foot of the Kamen' Volcano lie moraines at a height of 200-250 meters above sea level (103).

103. Konradi, S. A. and Kel', N. G. Geologicheskii otdel

Kamchatskoy ekspeditsii 1908-1911 /Geological Division of the 1908-1911 Kamchatka Expedition/. Isvestiia of the Geographical Society, 1925.

In the view of various researchers this is a foreland glaciation, which in places pressed forward as far as the coast (101). In contrast to this,

101. Komarov, V.L. Putishestviie po Kamchatke /Travels in Kamchatka/. Reports of the Kamchatka Expedition, St. Petersburg, 1912.

the glaciation on the west coast was not so extensive or so thick. The glacier pressed only a little beyond the foot of the mountains into the flat coastal plain. While on the east side, as has already been mentioned, the glacier almost reached the coastline, on the west coast it came only to a point 70-80 kilometers from the coastline at the same latitude as Petropavlovsk. (101) Further to the north, in the river area of the

101. Komarov, V.L. Putishestviie po Kamchatka /Travels in Kamchatka/. Reports of the Kamchatka Expedition, St. Petersburg, 1912.

Belaya, old moraines lie at a height of 630-687 meters above sea level, all of this being a sign that the glaciation in the west was slighter than that in the east. The glaciation of Kamchatka proceeded both from the eastern and from the western mountains. In the south, where the two mountain chains meet, the ice masses, too, joined together. On the other hand, the Kamchatka Valley itself was not glaciated, even though it was surrounded on three sides by glaciated mountains. In the interior of the long valley, which is only up to 80 kilometers wide, there are only river and lake deposits, and not until the rims do fluvioglacial formations and then also moraines appear (113). Thus the

113. Kushev, S.L. Geomorfologicheskii ocherk severnoi chasti tsentral'noi. Kamchatki. depressii i doliny srednogo techeniya reki Kamchatki /Geomorphological Sketch of the Northern Part of the Kamchatka Depression of the Valleys on the Middle Course of the Kamchatka River/. Doklady of the Academy of Science, Moscow, 1938.

glaciation of Kamchatka mirrors approximately the present rainfall. During the Ice Age the snow border lay at approximately 700 meters; today it lies at a height of 1, 500-1, 800 meters.

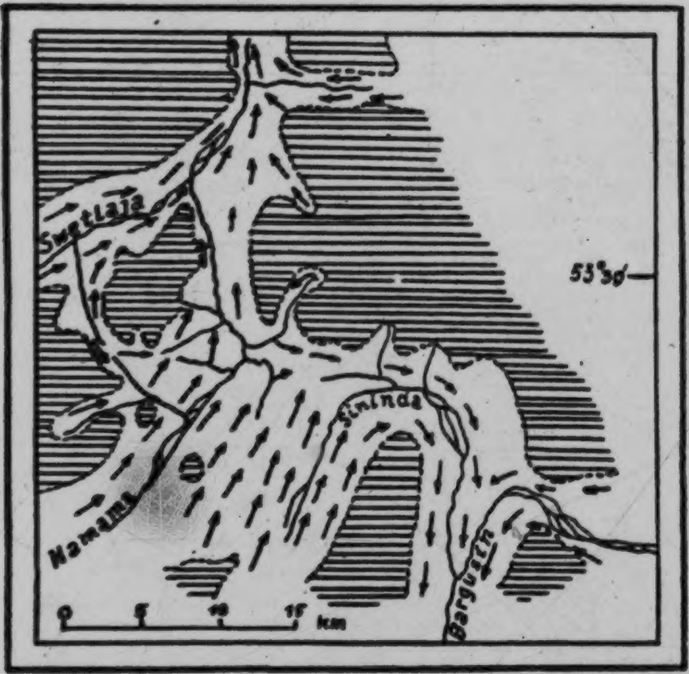
The area round Lake Baykal should be mentioned as the final area of extensive glaciation. In the first place this is a mountainous area northeast of Lake Baykal, and this mountainous area begins at the northeastern end of Lake Baykal and stretches beyond the Vitim to the Olekma (North Baykal mountain country, Patom Plateau). According to the writings of numerous researchers (Krapotkin, V. Obruchev, A. Gerasimov and others), the fact of an extensive glaciation of this area is beyond doubt, but opinions differ on the type of glaciation, and this is being clarified only gradually. V. Obruchev first asserted that it was an inland glaciation, and from here he came to the view that there was a great glaciation of all of north Siberia, but this was later proved erroneous. As proof of the inland ice character northeast of /49//Mapof Glaciation in Transbaykal (according to Eskola (58)/.

58. Eskola, P. "Beobachtungen über die Glazialbildungen in der Gegend der Wasserscheide zwischen dem Bargusin und der ob. Angara in Transbaikalien," Comtes rendu de la Societé Geologique de Finlande. /Proceedings of the Geological Society of Finland/ No. 1, 1929.

The sketch shows the extent of the glacier in the watershed region between the Barguzin and the Namama, which flows via the Svetlaya into the Upper Angara. The white areas represent the glacier with its various directions of flow. The directions of flow follows the river valleys, while the high plains lying in between remained free from all glaciation. The type of glaciation depicted in the sketch can be considered as typical of Transbaykal.) /50/ Lake Baykal, Obruchev points principally to the following marks: rounded mountain slopes, round knolls, gorges, gorge lakes, trough valleys, worked out terraces, Oser, etc., and also erratic blocks, which appear on the watersheds. Meister (123) /sic/ later pointed out that the "erratic blocks" on the watershed

123. Lopatin, I. A. Gol'dy /The Goldi/. Zapiski of the Society for Exploring the Amur Area. Vladivostok, 1922. /The author probably meant to refer to footnote 128: Meister, A. K. Vostochnaia okraiña Lenskogo zoloton osnogo raiona /The Eastern Border Area of the Lena Gold Fields/. Geological

Map of Glaciation in Transbaykal (according to Eskola (58).



The sketch shows the extent of the glacier in the watershed region between the Barguzin and the Namama, which flows via the Svetlaya into the Upper Angara. The white areas represent the glacier with its various directions of flow. The directions of flow follows the river valleys, while the high plains lying in between remained free from all glaciation. The type of glaciation depicted in the sketch can be considered as typical of Transbaykal.

are of local origin and consist of the same rock as that lying underneath, which otherwise is covered over with deposits. The rounded off slopes in these regions of permafrost could also have been formed by ground flows. Meister declared verbatim: "On the Vaga I saw loamy masses of great thickness which in their movement tore along with them century old trees as though a hurricane had passed through there; also embedded pieces of neighboring rocks from the earth were carried along--in a word: it was a recent loam glacier." (128) On the basis of this and other determinations, V. Obruchev changed his opinion and accepted the reduction of the glaciation from an inland ice covering in the north (Vitim-Olekma mountain country) to an Alpine type in the south. However, the results of further research have caused it to be recognized that we are dealing here generally with one glaciation of the Alpine type. Eskola (58) has conducted investigations east of Lake Baykal between the Vitim, Upper Angara and the Barguzin, and these investigations have clearly indicated the Alpine character for this region. The valleys of most of the rivers (Barguzin, Svetlaya, Sininda, Namama, Oktokitan, etc.) were filled with ice masses of great valley glaciers, which had a thickness of 400-500 meters. The higher elevations projected above the ice level of the valleys, but had themselves small glaciers, which descended to the valley glaciers. The Barguzin Mountain Range, whose surprising similarity to the Alps is brought out by all researchers, can be regarded as the best example for this region.

Research in the Gold Fields of Siberia, No. 10, 1914./

128. Meister, A.K. Vostochnaia okraina Lenskogo zolotonosnogo raiona /The Eastern Border Area of the Lena Gold Fields/. Geological Research in the Gold Fields of Siberia, No.10, 1914./, pp. 22-23.

58. Eskola, P. "Beobachtungen über die Glazialbildungen in der Gegend der Wasserscheide zwischen dem Barguzin und der oberen Angara in Transbaikalien" /Observations on the formation of glaciers in the area of the watershed between the Barguzin and the upper Angara in Transbaykal/ Comtes rendu de la Societe´ Geologique de Finlande. / Proceedings of the Geological Society of Finland/, No. 1, 1929.

Remarkably enough the valley of the Upper Angara, which stretches far to the east between glaciated mountain ranges (Upper Angara Range in the north, the Barguzin Range in the south) was not exposed to glaciation. 133

Also south of Lake Baykal the mountain ranges had glaciers, which in the valley of the Slyudyanka and Pokhabikha reached the level of Lake Baykal in the form of valley glaciers. Here more than 25 glaciers have been counted in an area of 60 square kilometers, but these were all only insignificant ones which at most had a length of 10 kilometers. The landscape is rich in gorges, which lie at very different heights ranging from 50 meters to 600 meters above the present level of Lake Baykal (454 meters above sea level). Thus the Ice Age snow boundary must have been very low here in comparison with the neighboring Sayan (around 2,000 meters) and the northeastern Baykal area (at least 1,200 meters). An explanation for this striking appearance can be seen in the fact that Lake Baykal itself even in the Ice Age /51/ exerted an influence on the climate of the surrounding areas, an influence which was especially noticeable here in the southern part where even today the rainfall is high. The slope of the Khamar-Daban turned toward Lake Baykal is the rainiest area in Transbaykal. But in addition there is the fact that southern Lake Baykal is an area of recent depression, which continues even today, and accordingly the traces of the glaciers can also be regarded as subsequently dislocated.

There are also local glaciations in Transbaykal apart from the above-described glaciated areas. The best known are the glaciations of the 2,500 meter high Sokhondo and neighboring mountains, where gorges, trough valleys, and even moraines appear on the slopes.

Traces of an old glaciation have also been found in the Dzhugdzhur, in the Stanovoy, which extends up to 2,482 meters in height, in the Tukuringra Range in the heights on both sides of the Zeya break-through, and in the Yam-Alin (2,215 meters). However, the signs are but slight throughout and appear only in a limited area, and accordingly here there were at most individual dotted glacier formations.

The Permafrost and Its Significance

The largest part of the Soviet Russian Far Eastern region lies in the sphere of the permafrost or the Eternally Frozen Earth, as this 132 134 on the east coast is distinguished by heavy clouding and numerous fogs. In July as a rule half the days are foggy. 132

The western coastal area is more under the influence of the Sea of Okhotsk and is dominated in winter by the cold and dry monsoon and northeast and east winds, which come from the center of the peninsula and which are cold and dry, in contrast to the east coast. For these reasons the rainfall in the winter is only a fraction of the summer rainfall: the winter rainfall is only a fourth to a third of the summer rainfall. The snow covering on the west coast is therefore slight, generally reaching only 40 centimeters. However, the distribution is uneven since the winds coming from the mountains often blow the mountains free of snow and pile the snow in the troughs and valleys. However, in contrast to the east coast, snow storms are a rare phenomenon. Summer is cool and especially foggy, the clouding is very great. The local winds, which move into the interior of the island, often carry fog into the land for days and bring a damp coolness, which is of little help to plants. /80-81/Charts on following pages/ /82/ The vegetation period is significantly shorter on the western side of the peninsula than on the eastern side.

The peninsula's central depression, which for the most part is occupied by the valley of the Kamchatka River, is extensively protected from the influences of the sea by two mountain chains on the east and the west; accordingly clearly marked, continental traits can be recognized in the climatic conditions here. Summer is warmer and drier than on the coasts; winter, on the other hand, is harsh but brings less snow than on the east coast, though even more than on the west coast. Characteristic of the central depression are the rapid transition from winter to summer and the warm autumn; accordingly we find here the longest vegetation period on the peninsula. The stone birches unfold their buds already in the middle of May here, while they appear in the coastal areas only around the 15th of June. As a consequence of this favorable condition, Kamchatka's central depression is most favorable for agriculture, which has already spread here on a large scale, while the coastal areas offer more opportunities for developing animal breeding.

The Border Seas of the East

Through its possession of the Kurils and southern Sakhalin, the 133
Sea of Okhotsk has become a Soviet Russian internal sea since

/33 World War II. It is separated from the Pacific Ocean by the barrier of the garland chain of the Kurils, where the numerous openings, which are only of slight depth, allow but a surface exchange of water. There are two connections with the Sea of Japan: La Perouse Strait and the Tatar Straight. The latter has been shut off by a dam connecting Sakhalin with the mainland since 1952. For the rest, the Sea of Okhotsk washes against the western side of Kamchatka, the mainland coast, and the north and east coasts of Sakhalin.

The Sea of Okhotsk

The northern coast seems more divided up than the other coasts. the Taygonos Peninsula divides the great Shelekhov Bay into the Gizhiga and Penzhina bays. West of Cape Koni the Tauyskaya Bay penetrates into the land, and in a part of this bay--the Nagayevo Bay--lies the harbor of Magadan which has become very well known in recent years. In the extreme west, where the mountain chains stretch into the sea, land and water penetrate one another and cause a disturbed, horizontal division; the Shantar Islands lying off the coast contribute to this. Apart from these islands and some coastal islands in the north, the Sea of Okhotsk is poor in islands; only the rocky /83/ /Map of the Sea of Okhotsk:/ St. Jonas Island lies alone in the watery area of the western part. For the rest the coasts appear strikingly rectilinear. On the west coast the mountains run parallel to the coast and slope to the coast in a steep descent. Flat approaches to the sea are found only at the mouths of rivers or behind bays. On the other hand the coasts of Kamchatka and Sakhalin are overwhelmingly flat.

/84/ The greatest depth in the Sea of Okhotsk lies in the south, where a channel more than 3,000 meters deep stretches parallel to the Kurils; the greatest depression here is as much as 3,374 meters. From this deep sea valley the bottom of the sea rises steeply to the barrier of the Kurils, and then on the other side of these islands, it declines sharply to the long Kurils deep sea graben which is more than 8,000 meters deep. Toward the north, on the other hand, the bottom of the sea rises gradually. There the 200 meter-deep line runs along the coast at a distance of from 150 to 200 kilometers.

The main part of the water balance of the Sea of Okhotsk is equalized by the continual influx from the Pacific Ocean, just as in reverse there is a constant outflow from the sea to the ocean; also a limited exchange of water with the Sea of Japan via La Perouse Strait.

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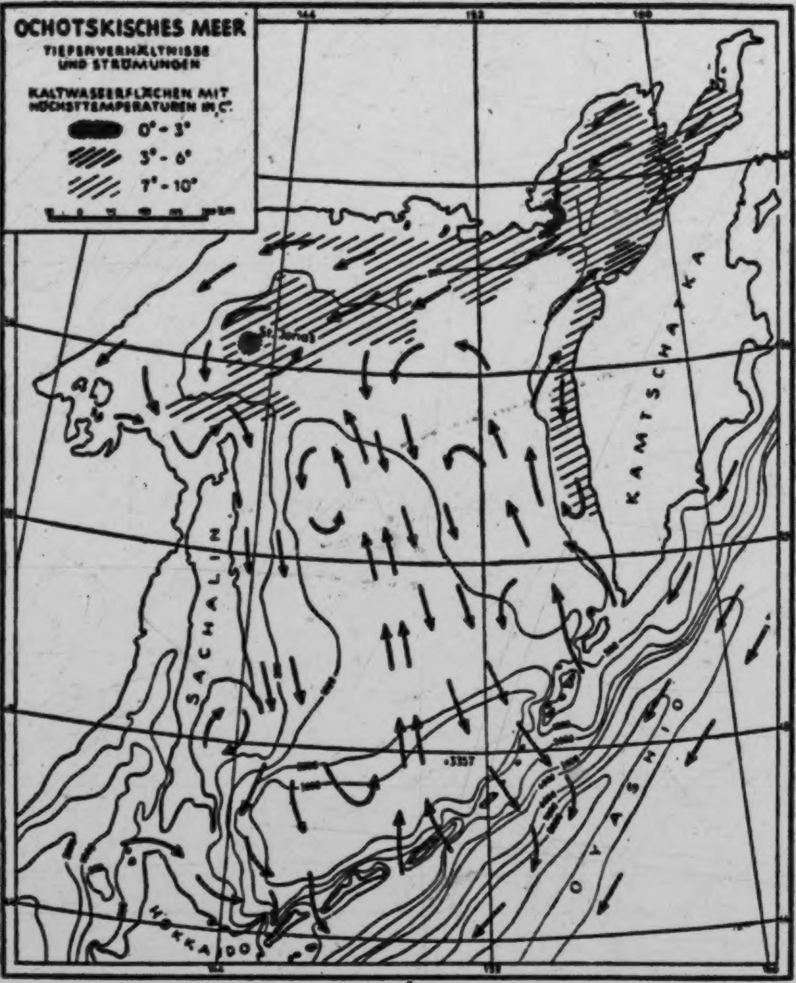
Map of the Sea of Okhotsk:


OCHOTSKISCHES MEER
TIEFENVERHÄLTNISSE UND STRÖMUNGEN
KALTWASSERFLÄCHEN MIT HÖCHSTTEMPERATUREN IN C°
0° - 3°
3° - 6°
7° - 10°
144
152
160
St. Jonas
KAMTSCHATKA
SACHALIN
HOKKAIDO
OYASHIO
3357

Depths and Currents; Cold water areas with highest temperatures in degrees centigrade takes place. The Pacific surface water enters the Sea of Okhotsk through one series of sea connections between the Kurils, while through others there is a surface flow of water from the sea to the ocean. At the deeper levels of water the exchange works in the opposite direction from that on the surface. Since only four of the sea straits between the Kurils are over 500 meters deep, and of these only two are over 1,000 meters deep, and since, in addition, their breadth is very slight, the exchange of deep water is kept within very limited borders and has as good as no influence in the sense of an equalization of temperature between sea and ocean. In this the bulk of the water layers of the Sea of Okhotsk, which lie more than 1,000 meters deep, cannot be drawn at all into an exchange. 133

Even though the picture is somewhat confused by the numerous openings and their various current directions, a clear sea current can nevertheless be recognized within the Sea of Okhotsk; this sea current moves counterclockwise along the coast. It enters the Sea of Okhotsk south of Kamchatka Peninsula and moves toward the north along the west coast of this peninsula; in the north, however, it is pushed somewhat off the coast by a cold water stream coming from the north. In Shelekhov Bay the current turns and follows the coast toward the west. This turn in the bay and the slanting stretches following the coast lead to the presence of cold water upwelling /Auftriebwasser/, which is drawn into the general current; this general current then follows the west coast farther, washing up around St. Jonas Island. Strengthened by the influx of water from the Amur, the current then runs along the east coast of Sakhalin toward the south, where it unites with the water stream coming from La Perouse Strait, and then again reaches the Pacific Ocean through the southern gaps of the Kurils. The currents in the middle of the Sea of Okhotsk fit into the framework of the main current described.

Tides appear on all of the Sea of Okhotsk. The tidal wave comes from the Pacific Ocean and enters the area of the Sea of /85/ Okhotsk through the gaps between the Kurils; the tidal wave is strongest in the middle of the island chain and then spreads out almost equally. The range has a mean of 4 meters in the open parts of the coast, but in the interior of the great bays it grows strong and reaches, for example, 11.3 meters in Gizhiga Bay.

The long, cold winter with its raw winds blowing from the mainland causes a marked cooling off of the water; the short and cool summer with predominantly heavier clouding and numerous fogs brings 132 133

/32 /33 only a slight warming up; and accordingly the temperature of the surface water layer rises only a little above 10° in the summer. This seasonal rise in temperature applies, however, only to the water levels to a depth of at most 30 to 50 meters, while the layers lying under this have a constant temperature, which is negative /in Centigrade/. Investigations have shown that the water temperature at first gradually decreases as the depth increases and then with a leap the water temperature reaches 0° already at a depth of 15 meters. Then the temperature lowers only very slowly, reaching -1.5° at depths from 75 to 150 meters. Then follows a slow rise in temperature until the bottom of the sea, where a temperature of 1.2° dominates in the north and one of 2.5° dominates in the southern part of the sea. With the formation of ice and the crystallization of salt, the surface waters can become so thick that they sink toward the depths.

Characteristic of the Sea of Okhotsk are constant cold water zones, which are a permanent phenomenon in certain areas and which give these parts of the sea a special stamp. These cold water zones are related genetically to the current conditions and can be explained as upwellings /Auftriebswasser/. Three such regionsshould be named above all: the one off the Yama Bay in the area of the Yamsk Islands; the one around Jonas Island; and the third in the open sea approximately between the north end of Sakhalin and the Shantar Islands. Within the first two cold water areas mentioned, the water temperature never rises above 1°, and in areas around these places it always remains 3° to 5° below the mean temperature of the sea. Off the entrance to the Penzhina Bay the water temperature even in high summer is never higher than 5° to 6°. The current emptying into the Shelekhov Bay turns here within the bay again toward the exit and draws upwelling /Auftriebswasser/ from the smaller bays toward it; the appearance of the latter off the Yama and also the Penzhina bays is especially striking. From the Yama Bay the cold upwelling stretches toward the southwest and thus in the direction of the general current; in this the upwelling water gradually and partially warms up on the surface or in part also sinks down, but certain cold water stretches are nevertheless recognizable. The sea bottom elevation of the massif around Jonas Island, it is assumed, causes /86/ again the rise of cold water layers, which are very characteristic of the environs of the island. The water is never warmer than 1° in the vicinity of the island and never more than 1° to 3° a bit farther off the island. The cold water zone lengthens from Jonas Island then toward the south, where there is still further cooling off between the Shantar Islands and the north end of Sakhalin; /32 the cause of this is regarded as the strengthening of the general current by the addition of the water masses of the Amur. /33

The cold water zones are noticeable in summer because of the heavy formation of fog, which becomes heavier in relation to the contrast between the air and the water temperatures. For weeks in the summer there often lies over these regions thick banks of fog, which clear up only with bad weather. Nowhere in the Sea of Okhotsk is the fog so constant and so thick as in the area of the Yama Bay and around Jonas Island. The winds contribute to the spreading of the fog, and accordingly it also appears over regions with relatively warm water. But the source of the fog is clearly the cold water areas, where new masses of fog always form. These masses of fog are characteristic for the entire north of the Sea of Okhotsk and hinder sea traffic.

Since the Sea of Okhotsk projects far into the mainland mass of the continent--the low winter temperatures are, of course, known--a solid ice covering forms already in December along the entire coast from the Strait of Tatar in the south to Penzhina Bay in the north. In February the entire northern half of the sea is covered with floating ice, and the ice floes are often shoved together into a closed covering until a storm again tears them apart. Only by the middle of June is the bulk of the sea entirely free of ice. Further discussion of the ice covering and its significance for man is given in the section on sea transportation.

The salt content of the Sea of Okhotsk is slighter than in the /33 neighboring seas and varies between 32 percent and 32.5 percent. The salt content increases with the depth and reaches 33.5 percent to 34.5 percent at the bottom of the sea.

The Bering Sea

The Bering Sea is the most northerly border sea of the Pacific Ocean, from which it is separated by the islands of the Aleutian chain. However, the closing between the Bering Sea and the Pacific is not so shut off as is the case with the Sea of Okhotsk, since between the Commander Islands and the beginning of the Aleutian chain there is a connection which is up to 342 kilometers wide and up to more than 3,000 meters deep. Accordingly an exchange of water up to this depth can go on unhampered. The connection via the Bering Strait /87/ /Map of the Bering Sea:/ /88/ to the northern Polar Sea has, on

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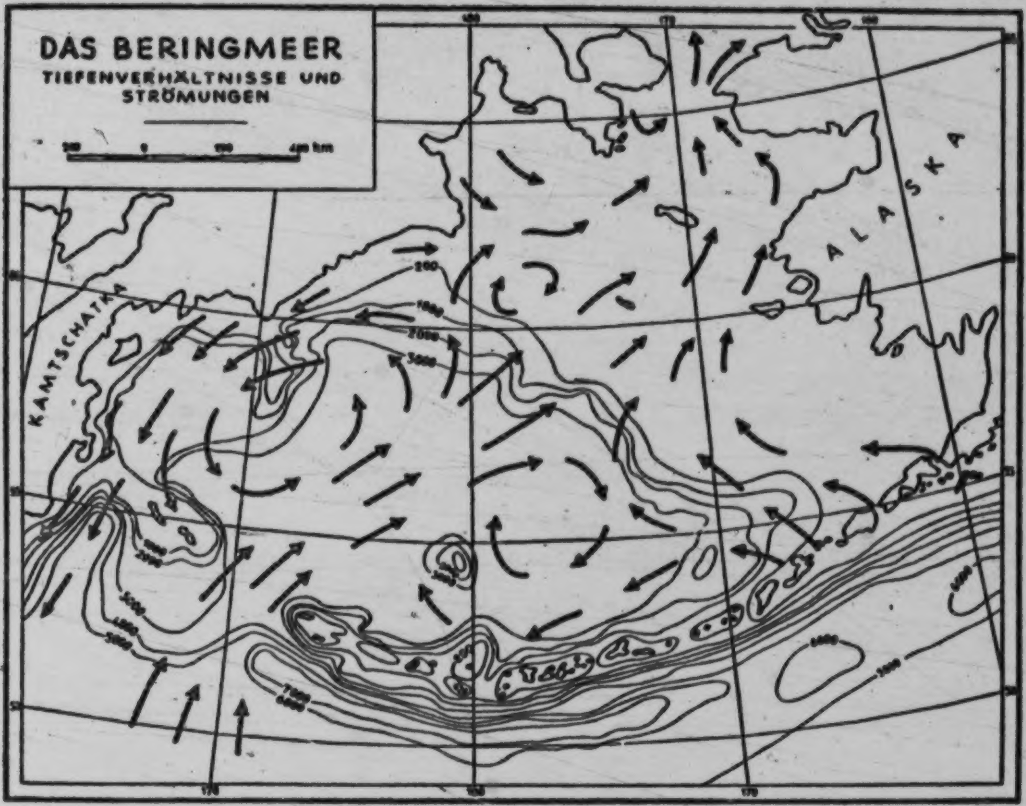
Map of the Bering Sea:


DAS BERINGMEER
TIEFENVERHÄLTNISSE UND STRÖMUNGEN
200 0 200 400 km
KAMTSCHATKA
ALASKA
200
1000
2000
3000
4000
5000
6000
7000

Depths and Currents

/87/

133

133 the other hand, a width of only 35 kilometers and a slight depth of up to 59 meters; accordingly the influence of the cold polar water from the Chukchi Sea is limited to a minimum. As a result of this there is an overwhelming equalization of the Bering Sea with the Pacific Ocean, which, however, has different facets according to the structure of the sea basin.

The Bering Sea can be divided into two parts according to the relief of the sea floor. The northeast as far as a line from approximately Cape Navarin on the Russian side to Unimak Island off the west end of the Alaskan peninsula rests on a mainland shelf, and everywhere has depths of less than 200 meters. This part comprises 44 percent of the entire area of the sea. From the above-mentioned line the sea floor declines very precipitously toward the south to depths of from 2,000 to 4,000 meters; thus this part of the Bering Sea is a deep sea basin. The portion of this part in the total area of the sea is 43 percent. The remaining 13 percent belongs to the sloping of the mainland parts to deep sea basins with depths of 200 to 1,000 meters. The greatest depth in the Bering Sea is 4,100 meters. (205)

205. Suslov, S.P., Fizicheskaja geografiia SSSR /Physical Geography of the USSR/, (Moscow-Leningrad, 1947), p. 226

The varying relief of the floor of the Bering Sea with the steep rise from deep sea basins to the shelf produces very complicated current conditions. The main stream of the Pacific water enters the Bering Sea through the main gate between the Commander Islands and the Aleutian Islands and turns toward the northeast in the direction of the Bering Strait. However, upon hitting the border of the shelf the current divides into an eastern and a western branch, with the eastern one remaining within the deep sea basin and ending in a circle-shaped current moving counterclockwise. The western branch also remains in part in the deep sea basin, and in the central part also becomes a circle-shaped current, moving, however, clockwise. A part of this western branch, however, reaches the mainland coast in the west and in Olyutorski Gulf draws up, to the surface cold water /Auftriebswasser/ in passing by which continues along the coast of Kamchatka toward the south. It leaves the Bering Sea with a strong current between Kamchatka Peninsula and the Commander Islands, and then in a relatively cold state unites with equally cold water coming from the Sea of Okhotsk, and becomes the Oyashio /Okhotsk Current/.

A part of the entering mainstream of the Bering Sea enters the shelf and with moderate speed draws in a northward direction over the Bering Strait into the Chukchi Sea. This current is reinforced by another Pacific current that presses in over the Unimak Sea strait (west of the island of the same name), immediately contacts the shelf and then flows alongside the west coast of Alaska along with the central current, and then via the Bering Strait into the Polar Sea. The accompanying sketch map serves to orient the reader as to further details on the currents of the Bering Sea. 133

For the most part the surface water temperature depends upon the general climatic conditions. Located in high latitudes /89/ and situated in between the mainland mass of northeast Siberia and northwest America with their long and servere winters, the Bering must be designated as a very cool sea. In the summer the surface waters along the shelf areas manage to warm up only to a limited degree and then, apart from the warm currents, reach temperatures of only 7 to 9 degrees. The surface water in the deep sea basin is as a rule warmer and reaches a warmth of from 10 to 11 degrees. It is of special significance and worthy of note that the surface waters of the Bering Sea, because of the permanent inflow of warm water from the Pacific throughout the whole year, cause the temperature of the Bering Sea to have a year-round temperature higher than that of the air. A. A. Borisov (39) 132 133

39. Borisov, A. A., Klimaty SSSR /The Climate of the USSR/, (Moscow, 1948), p. 122.

has published the following table:

Month	Water Temperature	Air Temperature
January	-1.0°	-3.8°
April	1.6°	-0.9°
June	10.3°	8.5°
October	6.9°	4.3°
Annual	4.7°	2.1°

Because of the exchange of deep waters with the Pacific Ocean, the deep-water temperatures of the Bering Sea are completely different from those of the Sea of Okhotsk. From a summer surface

132 133 temperature of 10°, at a depth of 30 to 40 meters, the temperature gradually drops from 4° to -6°. At 100 to 150 meters lies the coldest water level, with a temperature of from 0.5° to 1.0°. Below this depth, at from 200 to 500 meters, the temperature again rises to as high as 3.5° and then gradually drops again to from 1° to 2° at depths from 2,000 to 3,000 meters. The coldest surface water is found in the Olyutorski and Anadyr' bays. Both are characterized by constantly rising deep waters and especially strong clouding. The cold, southward-flowing current along the east coast of Kamchatka also creates thick fog banks, which are a special feature of the Kamchatka coast.

133 The salt content of the Bering Sea is, in general, high, reaching 32 percent at the surface and rising at a depth of 3,000 meters to 34.5 percent. It is only in the extreme north that the salt content diminishes, becoming at this point 27 percent, because of the influx of fresh water from the Anadyr' and Yukon.

During the winter all along the coast of the northern part of the Bering Sea, a solid ice sheet forms, in front of which is a broad area covering with floating ice floes, which also cling to the east coast of Kamchatka. The edge of the floating mass of ice runs somewhat south of the rim of the ice shelf and is parallel to the shelf. Off Anadyr' Bay and the entrance to the Bering Strait the floating ice accumulates and becomes thick pack ice. The warm water current causes the ice to melt very early, however. By the middle of May it remains only along the Asiatic coast, /90/ and in June it still remains only at Anadyr' Bay. By July the Bering Sea is completely ice free, and the ice edge recedes back to the Polar Sea.

The Sea of Japan

The Sea of Japan stretches between the Asiatic continent to the west and the islands of Sakhalin, Hokkaido, and Hondo /Honshu/ to the east. It is connected with the East China Sea by way of the Korea Strait (depth: 167 meters), with the Pacific Ocean by the Straits of Tsugaru (106 meters) and Shimonoseki (30 meters), and with the Sea of Okhotsk by La Perouse Strait (55 meter) and the now blocked-off Tatar Strait (8-10 meters). In view of these relatively shallow connections to the neighboring sea areas, the Sea of Japan stamps itself as a clear sea basin, of which more than half is at a depth of 2,000 meters and approximately one quarter has a depth of 3,000 meters. The descent of the sea floor to a depth of 2,000 meters is far more abrupt from the Asiatic continent than from the east. After the Korean Strait in the south and the Tatar Strait to the north the sea floor rises gradually. 133

If the Sea of Japan presents its own sea basin, it also displays surface current conditions characteristic of a peripheral sea. The warm Kuroshio Current/Japan Current/, originating at tropical latitudes, flows from the south to contact the Sea of Japan at the Korea Strait. Designated by the Japanese as the Tsushima Current, this stream of warm water divides itself at the Korea Strait into two arms. The eastern, which is wider and flows more rapidly, flows in a northerly direction along the coastline of the Japanese islands, while the weaker western branch flows in a northerly direction somewhat parallel to the Korean coast. The latter soon comes up against cold waters due to a water current coming from the north along the coast. In part the waters mix; however, for the most part, the waters of the western branch of the Tsushima Current are pushed eastward from the coast, gradually turning east and then southeast, and they unite with the still relatively warm general stream of the former Tsushuma Current which is on its way back and which ends in a circular current moving counter-clockwise.

The warm mainstream of the Tsushima Current, which stretches northward along the coast of the Japanese islands, gradually loses its strength. Part of its current flows out through the Tsugaru Strait; a further part is later lost in the north through La Perouse Strait into the Sea of Okhotsk, while the remaining current presses further north in the direction of the Tatar Strait. Emerging from La Perouse Strait out into the Sea of Okhotsk, it now strikes a cold current. At first the warm current is able to deluge the cold current, and is able to advance as far as the southwest coast of Sakhalin where its tempering influence is still felt. But then it weakens at the coast /91 Sketch Map of the Sea of Japan:/ and is turned farther north. The shallow depths of the Tatar Strait act as a barrier and soon put a halt to any further northward movement, so that the relatively warm current turns west and then southwest, in which process it pulls cold water along, which, because of its higher salt content, can be identified as upwelling water /Auftriebwasser/. The cold water current runs along the coast until /92/ it reaches Korea. It reaches Vladivostok, where it contributes significantly to the tempering of the water and air temperatures there, and then it moves along the coast of Korea toward the south, where it encounters the above-mentioned western branch of the Tsushima

Sketch Map of the Sea of Japan:

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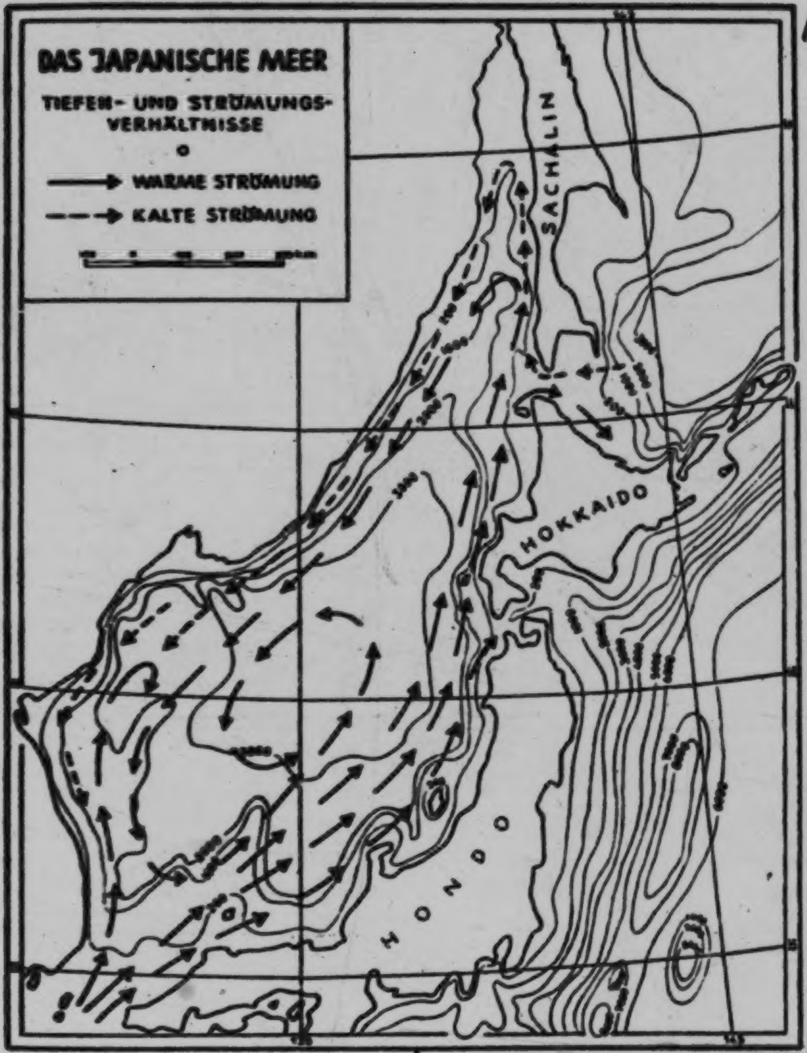
DAS JAPANISCHE MEER
TIEFEN- UND STRÖMUNGSVERHÄLTNISSE
WARME STRÖMUNG
KALTE STRÖMUNG
SACHALIN
HOKKAIDO
HONDO

Depth and Current Conditions

⟶ warm current
- - - -> cold current

/33 Current and there finds its end. On the way, the cold water current is strengthened by upwelling water, which is noticeable along the coast of the Sikhote-Alin', especially south of Ol'ga Bay, and which is distinguished not only by its greater coolness but also by its higher salt content. Where the cold water current encounters the warm current, a cold water front forms which, however, does not always remain in the same place in the course of the year. In winter the cold current appears to attain a greater strength and moves the cold front to the south, while in summer the cold front again withdraws to the north. (116)

116. Lautensach, H., Korea, (Leipzig, 1945), p. 118.

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/33 Because of the fact that the Sea of Japan extends so far from north to south--the Tatar Strait lies somewhat below the 50th latitude and the Korea Strait below the 35th latitude--the surface water temperatures in the various parts of the sea and in the course of the year are very different. In the area of the Korea Strait the surface water temperature varies between 26° and 14°, in the region of the Tsugaru Strait it varies between 24° and 5°, in La Perouse Strait it varies between 22° and 1.4°, and in the northern part of the Tatar Strait it varies between 17° and -2°.

The temperature of the water sinks very rapidly as the water gets deeper. In July, 1928, in the middle of the sea the temperature at the surface was 20.4°, at a depth of 50 meters it was still 3.4°, and at a depth of 100 meters it was only 0.8°. The last-mentioned temperature remains at depths of 500 meters and more. Nowhere, even at greater depths, has a lower temperature been determined. (205)

205. Suslov, S. P. Fizicheskaia geografiia SSSR /Physical Geography of the USSR/. Moscow-Leningrad, 1947.

/33 In winter the Tatar Strait is regularly closed by a solid ice sheet to approximately 50° N. Otherwise such an ice covering is formed only in the bays of the Soviet Russian Maritime Krai; this applies, however, to bays as far as Vladivostok, whose harbor can be kept open during the three winter months only with the help of icebreakers. Floating ice, however, can be encountered regularly every winter in the northern part of the Sea of Japan as far as a line approximately from the middle of the island of Hokkaido to the Korea Bay.

Tides are noticeable in all the Sea of Japan, but not in great measure. The tidal wave enters the Sea of Japan through the broad Korea Strait but then spreads so quickly that it is observed at practically the same time on all coasts. The range between high and low tide decreases the farther away one gets from the Korea Strait. Thus in Pusan it is still 2.10 meters, at the mouth of the Tumen it is only 0.30 meters, but it rises in the narrows of the Tatar Strait to as much as 2.70 meters. 133

The current conditions and the various water temperatures[1] affect the neighboring coastal regions in a remarkable fashion. On the mainland side the winters are under continental influence /93/ and bring a high degree of coldness. This applies especially to the Soviet Russian mainland coast and to Sakhalin. As a consequence the appearance of ice off the mainland coast extends farther to the south than it does in the eastern part of the Sea of Japan. Even in late spring the cold current brings in floating ice floes along the coast toward the south. In summer the cold coastal current along with the predominant east and southeast winds temper the air temperatures of the mainland coast. It is the source of the fog forming along the entire coast, especially during the summer; for the thickness and duration of the fog are greater in relation to the temperature contrast between the air and the surface of the water. This applies especially to the sea areas off the Soviet Russian coast, which with southeast winds predominanting are enveloped in thick, cool fogs. 132 133

The salt content of the Sea of Japan is greatest in the south where water with a salt content of 34.56 percent enters through the Korea Strait; the salt content is smallest in the Tatar Strait, where it amounts to 31.96 percent. In winter the salt content of the surface water rises and can reach up to 35.0 percent. The reason for this can be found in the slightness of the winter rainfall and in the decreased inflow of fresh water from the rivers. 133

A distinguishing mark of the Sea of Japan, important for sea transportation, is the frequent appearance of storms, which are especially numerous in spring and fall. They appear in the train of cyclones, which come from the mainland or the East China Sea and make use of the Sea of Japan as a route to the northeast. The number of these storms is not so great in the summer as in the transitional seasons, but they are of greater violence, especially in late summer when equatorial whirlwinds press into this region as typhoons and develop great wind velocities. In winter, on the other hand, the con- 132

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[1] [i.e. in the Sea of Japan--Analyst]

3: Thiel--214 K-4,5 (no date) 1953 RR1 Siberia RR1

Water Transportation and the Hydrographic Conditions

The development of water transportation has been favored by the fact that the most important regions economically belong to a single river area, that of the mighty Amur. Only the western part of Transbaykal has a water network of its own, but in its most important sections economically, western Transbaykal, too, is encompassed in a single river system, that of the Selenga.

The Amur is the largest river in the Far Eastern regions. It arises from two source rivers, the Shilka and the Argun, and the Shilka in turn is also formed by two source rivers, the Onon and the Ingoda. The longer of these is the Onon. If the Onon is taken as the real source river of the Amur, then the Amur has the great length of around 4,330 kilometers. However, even the real Amur from Pokrovka, where the Shilka and Argun converge, to the mouth has the considerable length of 2,846 kilometers. The entire river /drainage/ area of the Amur attains the immense size of 2,054,510 square kilometers. Of the rivers in the entire system which are at the disposal of the Soviet Union, 7,079 kilometers are designated as navigable for steamers, and anothers are designated as navigable for rafts.

The upper course of the Amur is 901 kilometers long and extends from Pokrovka to Blagoveshchensk, i.e., to the mouth of the Zeya. On its left side the Amur receives here the Amazar, Oldoy, and the Zeya. Great heights, which are covered with coniferous forests and which are in part rocky, follow the course of the Amur along the upper part. Below Dzhalinda the heights retreat. On broad terraces cultivated stretches of land appear with numerous settlments. The river bed becomes wider. Flat sand islands emerge here and there. Tortuously and slowly the river winds along. The middle course of the Amur stretches from Blagoveshchensk to Khabarovsk, i.e., from the mouth of the Zeya to the mouth of the Ussuri; it is 992 kilometers long. Great and important tributaries flow into this section of the Amur: the Bureya comes in from the left and the Sundari and Ussuri from the right. The left bank here is for the most part formed from the flat Zeya-Bureya plain, while the right bank, which is Manchurian, appears hilly. The width of the river reaches 1 to 3 kilometers and more, but is pressed together to approximately 500 meters as it breaks through the Bureya Mountain Range. However, below Khabarovsk the 953 kilometer long lower course of the Amur stretches out into an extraordinarily wide lowland river with numerous arms and islands.

133 Here, too, the left shore is mostly flat and swampy; the right, on the other hand, is hilly and drier. Now and again mountain chains also appear /190/ on both sides of the river and force its masses of water into a closed bed. The last part of the river is closed in on both sides by mountains, although the river still reaches a width of 5 to 10 kilometers in places.

[505] The Amur is navigable for its entire length, and its source rivers, too, are still regularly traveled by steamers, the Shilka being traveled as far as Sretensk and the Argun as far as Olochi. The speed at which the Amur flows is varying and depends on the drop at any one spot. In this the river has to overcome three steps: the Great Khingan, the Bureya Mountain Range, and at the end the Sikhote-Alin'. The mean velocity of the Shilka and of the upper Amur is 5.5 to 6 kilometers per hour, that of the middle Amur is 4.2 kilometers, and in the lower course of the Amur the mean velocity is 3 kilometers and less. The conduction of water varies greatly, especially in the upper course, since here the source rivers, especially the Shilka, dry up almost entirely in the period of less water--and here this period is the winter. At this time the Shilka conducts only approximately 8 cubic meters per second at Sretensk, while at the same place it conducts 142 cubic meters when the water level is normal, and 420 cubic meters when the water is high.

The following table shows what quantities of water the Amur carries along in its various parts and the differences in the water fluctuations at the various localities:

Localities	Length of this section of the river in kilometers	Drop of this section of the river in meters	Water conduction, Annual mean in cubic meters per second	Minimum in cubic meters per second
From Pokrovk--				
Albasin	238	55	1,200	125
Chernyayevo	190	49	1,500	165
Kumara	213	39	1,700	200
Blagoveshchensk	226	33	1,800	220
Poyarkovo	164	17	4,000	550
Innoken'yevska	130	17	5,000	700
Yek. Nikol'skaya	252	36	5,500	850
Mikh. Semenovskaya	190	14	8,500	1,500

(Table continued on following page)

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Localities	Length of this section of the river in kilometers	Drop of this section of the river in meters	Water conduction. Annual mean in cubic meters per second	Minimum in cubic meters per second
Khabarovsk	258	15	10,000	1,800
Komsomol'sk	360	16.5	11,100	2,000
Bogorodskoye	410	12	11,700	2,100
Mouth	170	4.5	12,200	2,200

Corresponding with the water conduction, the water horizon fluctuates more in the upper parts of the river than in the lower parts. The range of the annual water fluctuation is 9.7 meters at Sretensk, a mean of 6 meters at Khabarovsk, and only a little more than 2.40 meters at Nikolayevsk. However, the high water which appears very suddenly as a result of downpours of rain in the summer, varies greatly from year to year. The floods from the mighty /191/ river area often break so quickly that they cause great destruction. The largest known flood was in 1872. At Blagoveshchensk the water rose 10 meters in a short time, and in the narrow break-through valley of the Bureya Mountain Range the water even rose 15 meters. The water masses pouring out wildly and in an unruly fashion tore along with them numerous settlements near the river and their people, animals, and property. The year 1928, too, was distinguished by an extraordinarily heavy high water, which brought the city of Blagoveshchensk into a state of great distress.

Because of the ice covering the navigable period of the Amur is limited to the summer months. The mean duration of the ice-free period is 155 days at Sretensk, 170 days at Blagoveshchensk, 185 days at Khabarovsk, and again only 160 days at the mouth of the Amur. On the middle Amur the southern location makes itself felt, and at Khabarovsk the effects are felt of the emptying in of the great rivers coming from the south, the Sungari and the Ussuri. These two rivers become free of ice earlier than the Amur and bring warm water into the Amur. In the periods of navigability the view is hindered in the mountain regions by thick morning fogs which force the ships to travel more slowly or even to stand still. Then rapids and stony areas constitute a hindrance in the upper part, and sand banks in particular constitute a danger for almost the entire course of the river. The sand banks consist mostly of soft, slimy masses of sand, which form in the river bed as

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longish heaps which are constantly being added to; and when the water is low, these sand banks also often emerge as islands. The lower Amur has no hindrances and can be used at all times by ships with a depth of up to 3 meters, and on the last 420 kilometers of the river it can even be used by ships with a depth of 6 meters and more. If broad, flat sand bars did not close off the entrance at the mouth of the river, sea-going ships could travel 100 kilometers into the Amur. The annual changes of the water conduction causes the ship traffic on the upper part of the Amur to be such that from May to August ships with a depth of 1.5 meters can go as far as Blagoveshchensk and ships with a depth of somewhat more than 1.0 meters can get as far as Sretensk on the Shilka without hindrance. In September, on the other hand, travel as far as Blagoveshchensk is dangerous for ships with a depth of 1.20 meters and travel as far as Sretensk is dangerous for ships with a depth of 0.90 meters. These limitations apply to through traffic and do not exclude the possibility that in individual parts of the river, where shallow places do not hinder passage, larger ships could also be employed without limitations in local traffic.

The Amur as the main water vein in the entire land receives its great importance for transportation only through its numerous and important tributaries. These are in large measure navigable by ships, and over even larger lengths navigable by rafts, and thus open up wide areas of the entire province.

The Shilka is the main source river of the Amur and drains the water from an area of more than 210,000 square kilometers. Its source river, the Ingoda, is navigable by rafts for 455 kilometers, and, when the water is high, it is hypothetically navigable by ships from approximately Chita on. The Ingoda itself and its right tributaries come from richly forested areas and bring /192/ to the Amur wood above all. The Onon is navigable by rafts for 550 kilometers. In its upper course it is a steppe river, and only in its lower course does it flow through forested region.

The Argun, with a total length of 1,580 kilometers, drains an area of 260,000 square kilometers. It rises in the Great Khingan in Manchuria, where it bears the name of Hailar, and it receives also numerous tributaries from the right. Thus it never suffers from a water shortage. On the other hand mountains appear right on the river at its lower end and produce various strong rapids. The bed is stony and not uncommonly is filled with large blocks of rock, which in many cases lie across the river like chains, making it very difficult for ships to get through. Although its middle course along the border is 200 to 300 meters wide and has sufficient depth, which in places it up to 8 meters, the Argun is regularly traveled only on the last 54 kilometers. The floating of wood, on the other hand, is very active on the entire course of the river.

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The Zeya with a length of 1,225 kilometers and a width of up to 2 kilometers, is the most important left tributary of the Amur. In its upper course it has a sharp drop, and only below its breach through the Tukuringra Mountain Range does it quiet down. The monsoon air masses, which are forced to rise in the mountains in the area around the upper course of the Zeya, bring especially heavy rainfall here. The water conduction reacts very exactly to this rainfall, and thus, according to the downpours of rain, high waters arise and the river then again and again goes over its normal banks. Thus during almost the entire summer the Zeya conducts a great deal of water and is hypothetically navigable for medium-sized steamers for 950 kilometers and even 1,100 kilometers for smaller steamers. Zeya-Pristan' (harbor) is the end point of the regular steamer traffic. Here the goods are stored up during the summer in large warehouses in order then in the winter to be taken by sled into the gold districts on the upper course of the Zeya and on its tributary, the Gilyuy. The new Baykal-Amur Railroad crosses the river at Zeya-Pristan'. From the left there flows into the Zeya the Selemdzha which is 690 kilometers long and which is navigable by ships as far as Norsk.

Water Conduction of the Zeya

Locality	Annual Mean in cubic meters per second	Minimum in cubic meters per second
Zeya-Pristan'	1,100	22
Tyda Estuary	1,350	45
Selemdzha Estuary	2,100	105
Mouth	2,350	125

The Bureya, the next large left tributary of the Amur, is 740 kilometers long and up to 700 meters wide on its lower course. The upper and middle course of the river flow through mountainous regions and conceal numerous obstacles. Thus the river, which is rich in water, is navigable only on its last bit. When /193/ the water level

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is high, however, steamers get over 345 kilometers along the river as far as Chekunda, indeed on occasion as far as the mouth of the Unalta. The Bureya is important as a supply route for the gold regions on its upper course.

The Zeya and Bureya bring a great deal of wood to the Amur.

Water Flow of the Bureya

Locality	Annual Mean in cubic meters per second	Minimum in cubic meters per second
Niman Estuary	392	8
Ushumun Estuary	579	11.5
Talakan Estuary	980	19
Daldakan Estuary	1,025	19.5
Mouth	1,067	20

The Ussuri River is on the border toward Manchuria. Its length, including that of its source river, the Daubikhe, is more than 900 kilometers, its width fluctuates between 100 and 1,000 meters. It is navigable by ship for its entire course, and it is regularly traveled even though sand banks and other shallows offer obstacles on the winding course. The Ussuri line is the best opened up in terms of transportation, for the main railroad and a highway also run in the direction of the river.

501 Water transportation in the Amur area is mostly served by small steamers with a mean of 500 indicated horse power and with a carrying capacity of their own of 250 tons. However, recently numerous larger vessels have also been employed which have been specially built for service here. As a rule wide, shallow-draft barks are used to transport goods; these barks have a carrying capacity of up to 800 tons and are mostly put together in trains of barges. The number of river steamers and tug boats in the 1930's was more than 200 and has since probably been enlarged. In addition to the transporation fleet, there is also an Amur war fleet, which has its seat in Khabarovsk and which consists of river gun boats with a size of up to 1,000 gross register tons.

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The main part of Transbaykal to the west is drained by the system of the Selenga. The Selenga comes from Mongolia and rises there from the two rivers, the Ider-Gol and the Muren-Gol. The length of the Selenga is 1,272 kilometers, its river area covers 511,464 square kilometers. Not far from Kyakhta it enters the territory of Transbaykal,

where it flows for another 414 kilometers. In this part the Selenga is 200 to 450 meters wide and has a mean depth of 1.6 meters. The mean velocity reaches 5.6 to 8.5 kilometers per hour. Apart from a bar off the mouth, which makes entrance into the river difficult, there are no large hindrances here, and accordingly the Selenga can be designated as completely navigable in this part. Occasionally smaller steamers travel 480 kilometers into Mongolia during the high water period in the summer. The period when the river is navigable lasts exactly half a year. The water level during this period fluctuates approximately 2 meters as a mean. Regular steamer shipping /194/ has developed as far as Ust'-Kyakhta. The tributaries are traveled as needed. The largest tributaries are the Chikoy, which is more than 740 kilometers long and is navigable by ship for 249 kilometers; the Khilok, which is 742 kilometers long; and the Uda, which is 403 kilometers long. The center of water transportation is Ulan-Ude, where there is also a dockyard for steamers and barks. In connection with the Selenga there is also water transportation on Lake Baykal and on the Angara as far as Irkutsk. The total number of steamers here in 1930 was 87, and the total number of barks was 185 in contrast to only 13 steamers and 18 barks in 1912. 133 505 [504]

The importance and the capacity of water transport on the Amur exceeds that of the Selenga by several fold. The following table gives a comparison: 505

Water Transport 1939
in 1,000 tons

	Total	Oil	Wood		Grain	Mineral Construction Materials	Salt
			By ship	By raft			
Selenga	200	7	7	91	45	14	1
Amur	1,305	191	11	645	186	65	13

Air Transport

Air transportation was early introduced into the entire Far Eastern region to overcome the great distances. The main line coming from Moscow leads via Chita and Khabarovsk to Vladivostok. Beside the direct line, flights are made along this stretch to the following localities: Ulan-Ude, Chita, Nerchinsk, Mogocha, Skovorodino, Tygdinsk, Svobodnyy, Arkhara, Birobidzhan, Khabarovsk, Bikin, Iman, Voroshilov, 509

132 service and help from ice-breakers, could very much expand the use-
654 fulness of the parts of the sea threatened by ice. And here the Soviet
government has accomplished excellent work worthy of recognition.

The center of all the coastal traffic is Vladivostok, from which
505 all lines start. Sea traffic is most active in the most southerly part of the coast as far as Nikolayevsk on the Amur. However, the more northerly localities are also visited regularly several times a year. The longest line leads to the mouth of the Kolyma, whence a trip by one or even several steamers at the same time is undertaken every year. Of the 2,021,000 tons of goods turned over in the harbor of Vladivostok (1935), 864,000 tons came from coastal traffic.

The following figures on distances may explain transportation conditions:

Coastal Steamer Lines

Distances from Vladivostok

Sovyetskaya Gavan'	1,075 kilometers
Aleksandrovsk on Sakhalin	1,335 kilometers
Nikolayevsk on the Amur	1,575 kilometers
Okhotsk	3,210 kilometers
Petropavlovsk	2,785 kilometers
Anadyr'	4,640 kilometers
Mouth of the Kolyma	5,200 kilometers

(Next table on following pages)

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/205/ B. SPECIAL SECTION

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/207/ THE PROVINCES

General Division

133 As the general survey has already shown, the geographical conditions of even a large division of the entire region fall into [1]

[1] [Cf. cat. 133, p. 232 for continuation — Analyst]

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	Final Establishment of the Ice		Final Becoming free of Ice		Mean number of Days with Ice*
	Earliest	Latest	Earliest	Latest	
Cape Chaplin	27 Oct.	8 Nov.	20 June	15 July	240
Sea south of Markovskaya Bay	25 Oct.	28 Nov.	12 June	27 July	230

* The mean number of days with ice includes drift ice and established ice.

133 individual natural areas. In the following consideration these natural areas are again divided into individual provinces, with the relief serving as the principal basis for the division. Given the size of these individual provinces it is obvious that in addition to many common traits in a given province there are also differences in the individual parts of the province. Accordingly, a further subdivision could be carried out without difficulty. However, this has intentionally been forgone for reasons of clarity.

The varying treatment of the individual provinces and their parts is a consequence of the uneven knowledge of many parts of the land. In going through the Russian literature, one can again and again determine that in addition to well-known regions there still exist extensive areas which require exact investigation. In contrast to the individual research prevailing in the Czarist period, Soviet Russian science has gone over more to a systematic penetration. However, with the great size of the entire land, much still remains to be done.

Transbaykal is divided by the Yablonovyy Ridge into two provinces: according to Obruchev, these can be designated as the western or Baykal province and the eastern or Nerchinsk Daur province. Toward the north the individual mountain ridges come together to form extensive plateau areas. To this category belongs the Vitim Plateau, which is grouped as a unit with the mountain forest areas adjoining it to the north and equipped with an equally raw climate. The mountain country between Vitim and Olekma and the Olekminsk Stanovik contitute the transitional area to the actual Amur country. Here the Zeya and Bureya mountain country marks the border of the economically important Zeya-Bureya plain. Again accompanying the lower Amur is a depression, which flows together with the Amgun area. The Sikhote-Alin' and the Ussuri-Khanka depression constitute individual

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provinces of the Ussuri country. The division of the remaining regions follows of itself: the island of Sakhalin, the region of the Amgun and Uda, the Okhotsk coastal country, the provinces of the extreme northeast and of Kamchatka Peninsula (see map). A short survey of Lake Baykal precedes the description of the provinces.

/208/ Lake Baykal

Adjoining Transbaykal on the west is Lake Baykal, which belongs among the most interesting lakes in the world. It has a water surface of about 23,000 square kilometers, a length of 636 kilometers, and its greatest width is 79 kilometers. The smallest width, between the mouth of the Buguldeyka and the delta of the Selenga, is only 25 kilometers. The lake lies on the mean at 453 meters above sea level, but the lake floor sinks down 1,741 meters, thus reaching 1,288 meters below sea level and so making Baykal the lowest internal lake in the world. The mountains right on the shore rise more than 2,000 meters, and, as a result, there are height differences of more than 3,700 meters within a very small area. From this the tectonic formation of the lake can also be recognized. This occurred through the inroads of four grabens shoved approximately toward one another; of these grabens, the most southwesterly one runs in the Sayan direction and the others, on the other hand, run in the Baykal direction. This explains the long swung, arc-shaped form of the lake basin. In terms of time the formation of Lake Baykal was related to the graben breaks of Transbaykal and must have occurred after the middle Tertiary. The lake acquired its present form and shape in the time between Pliocene and Quarternary.

The temperature of the water is extraordinarily cool, and even in August, which brings relatively the highest temperatures, it never exceeds 9° to 10°. In the vicinity of the shore the surface water is somewhat warmer, and only in some bays, which are favorably located, does the water temperature rise to 15° to 19° at the highest. From a depth of 255 meters on the water temperature remains approximately constant at 3.5°. At a depth of 900 meters a temperature of 3.4° has been recorded, and at 1,600 meters one of 3° has been recorded. The frequent, very violent storms are primarily responsible for the coolness of the surface water. These storms again and again stir up the water, but, on the other hand, they also see to it that Lake Baykal freezes over only at the beginning of January. As a mean established

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133 over long years, Lake Baykal remains for 116 days under a solid ice
132 covering, which can attain a thickness of up to 1.25 meters.

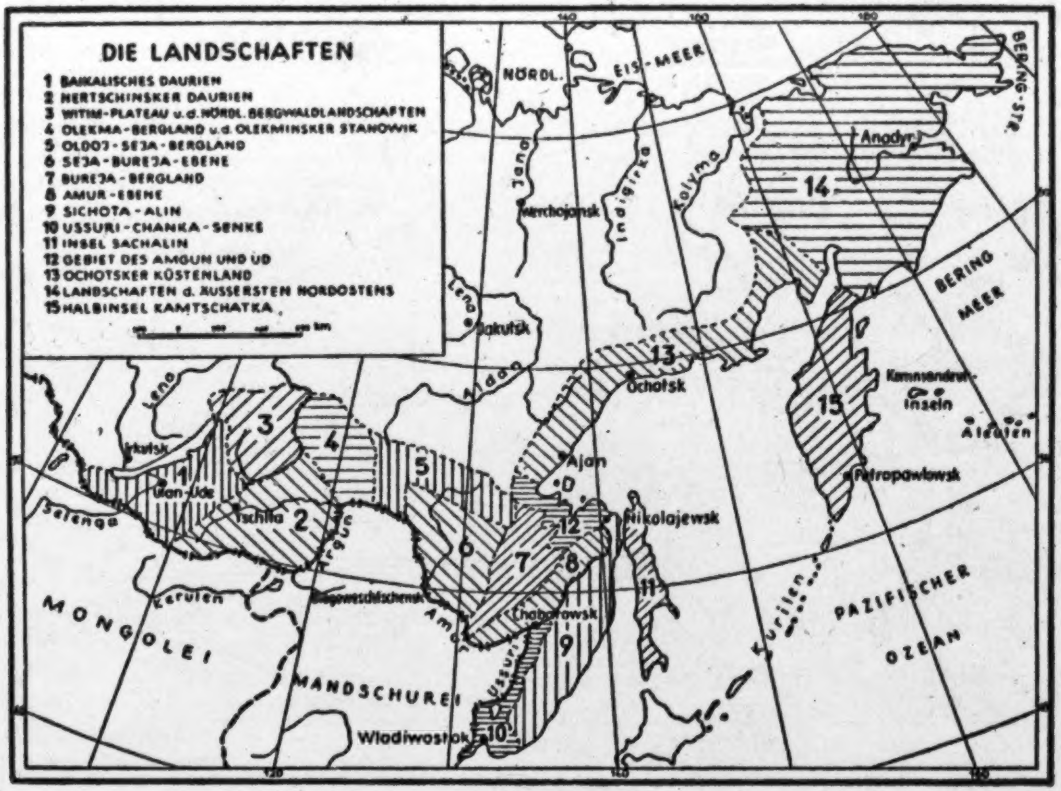
The fauna of the lake[1] is peculiar, representing a true collection
136 of endemic forms. Of the 1,000 types determined so far, around 75 percent are endemic. Here in the middle of the continent there is a type of seal called "nerpa" by the Russians (Phoca sibirica), which is related both to the same type found in the Arctic Ocean (Phoca hispida) and also to one found in the Caspian (Phoca caspia). The next fauna worthy of mention is the small, viviparous spider fish (Callionymus baicalensis), whose family (Comephoridae) is peculiar only to Lake Baykal. Exceedingly large is the number of mollusks. To date 85 types have been determined, of which two endemic families of brachiopods (Benedictiidae and Baicaliidae) are typical fresh water representatives. The great age of the Baykal fauna, which must have followed an isolated development, indicates the /209/ /Sketch Map of the Provinces://210/ appearance of the Baicalia mollusks already in the fresh water deposits of the lower Cretaceous in Transbaykal.

505 As a result of its depth and its favorable natural landing places, Lake Baykal offers the best opportunities for water transportation. A steamer line which is traveled regularly, connects all the larger settlements with one another and also serves the transportation of goods. Wood constitutes the bulk (40 percent) of the goods transported, in second place are stones and building material (30 percent), then follow fish, salt, flour, and others. The wood as a rule is floated down the rivers to the lake and then is transported by steamer tugs to the mouth of the Angara, where it is transferred to the railroad in Baykal station, which is equipped with mechanized loading equipment, or a small part of it is floated directly to Irkutsk. Wood is delivered on the Transbaykal side primarily by the river areas of the Barguzin and the Upper Angara.

228 Also of economic significance is fishing, which is pursued both in the open sea and also in the bays. The principal role in this fishing is played by the catching of a type salmon, the omul (Coregonus omul Pall. or Coregonus migratorius), and of fish related to the omul: these fish constitute 58 percent to the catch.. In second place are types of carp (22 percent), which are caught primarily in the lagoons and in neighboring lakes. Also the catch of seals, already mentioned, is not insignificant. In 1948 there were 1,380 animals caught. Fishing is pursued both by the state and also by fishing kolkhoz. The latter caught 68 percent of the total catch in 1949, while the state was

[1] [i.e. Lake Baykal -- Analyst]

Sketch Map of the Provinces: (Captions to map on following page)


DIE LANDSCHAFTEN
1 BAIKALISCHES DAURIEN
2 NERTSCHINSKER DAURIEN
3 WITIM-PLATEAU u.d. NÖRDL. BERGWALDLANDSCHAFTEN
4 OLEKMA-BERGLAND u.d. OLEKMINSKER STANOWIK
5 OLDOJ-SEJA-BERGLAND
6 SEJA-BUREJA-EBENE
7 BUREJA-BERGLAND
8 AMUR-EBENE
9 SICHOTA-ALIN
10 USSURI-CHANKA-SENKE
11 INSEL SACHALIN
12 GEBIET DES AMGUN UND UD
13 OCHOTSKER KÜSTENLAND
14 LANDSCHAFTEN d. ÄUSSERSTEN NORDOSTENS
15 HALBINSEL KAMTSCHATKA
km
NÖRDL. EIS-MEER
BERING-STR.
Anadyr
Jana
Werchojansk
Indigirka
Kolyma
BERING MEER
Lena
Jakutsk
Aldan
Ochotsk
Kommandeur-Inseln
Aleuten
Irkutsk
Ulan-Ude
Tschita
Selenga
Argun
Ajan
Nikolajewsk
Petropawlowsk
MONGOLEI
Kerulen
Blagowestschensk
Amur
Chabarowsk
Ussuri
Kurilen
PAZIFISCHER OZEAN
MANDSCHUREI
Wladiwostok
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(Captions to Map on page 235)

1. Baykal Daur
2. Nerchinsk Daur
3. Vitim Plateau and the northern mountain forest provinces
4. Olekma mountain country and the Olekminsk Stanovik
5. Oldoy-Zeya mountain country
6. Zeya-Bureya plain
7. Bureya mountain country
8. Amur plain
9. Sikhote-Alin'
10. Ussuri-Khanka depression
11. Sakhalin Island
12. Area of the Amgun and the Uda
13. Okhotsk coastal area
14. Provinces of the extreme northeast
15. Kamchatka Peninsula

responsible for 32 percent. On the Transbaykal side, in the area of the Buryat-Mongol ASSR, approximately 30,000 double centner of fish are caught annually; in good years even more than 35,000 double centners of fish are caught. Thus a series of fishing settlements animate the Transbaykal shore. The most important are Nizhne-Angarsk, which lies on the extreme north east tip, Ust'-Barguzin at the mouth of the river of the same name, where there is also a fish canning factory, and, south of this, Goryachinsk, which in addition to fishing is acquiring a growing importance as a health resort because of its hot springs. 228 361 [255] [312]

Baykal Daur

Baykal Daur begins in the west with the Khamar-Daban. This mighty mountain massif, projecting up to 2,217 meters, follows the southern shore of Lake Baykal. Along this shore, runs the railroad which encircles Lake Baykal and which is forced to follow all its windings. This mountain massif is little divided and has predominantly soft forms with dome-like heights which are seldom rocky. These heights, as Prassolov describes them (160), give the impression of being 133

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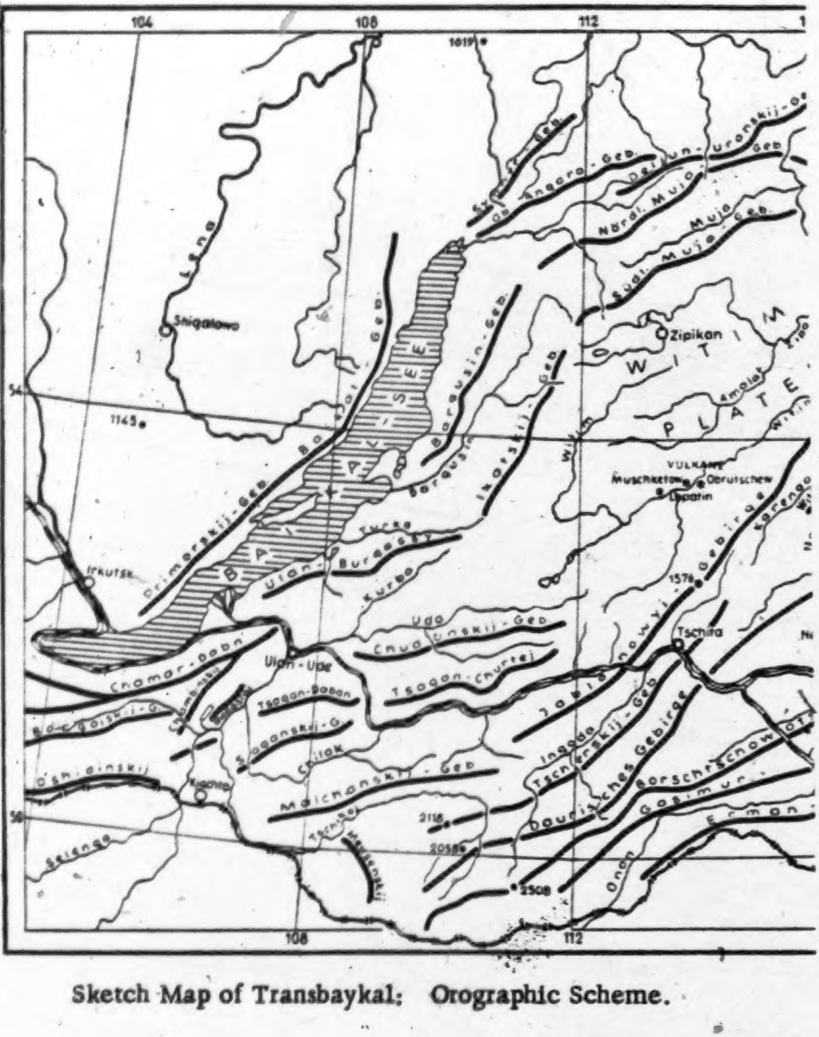
160. Prassolov, L.I. Iuzhnoe Zabaykaliye /Southern

•133 Transbaykal/. Material for Doing Research on the Ground in Asiatic Russia. Moscow, 1927.

flat steps, heaped up on one another; they appear easy to climb from the south but break off sharply toward Baykal. However, sharp ridges and pointed, pyramid-shaped mountains appear in the western part, especially in the area of the upper course of the Temnik and the Snezhnaya. Here also lie /211/ /The page itself is blank. Attached to it, however, is a sketch map of Transbaykal: Orographic Scheme[1] /212/ the greatest projections of an Alpine type, rich Karbildungen /Karformations/, and other traces of a former glaciation. The bulk of the mountain range has a width of 40 to 70 kilometers and heights of only between 1,200 and 1,600 meters. But the saddles and passes are only 200 meters lower. Outcroppings of basic stone, principally gneiss and granite, occur mostly only on the lower parts of the slopes. The southern and eastern parts present a motley geological picture. Represented here primarily are crystalline limestone and other matamorphic rock, then porphyrite and basalt. In the Khamar-Daban radioactive materials have been determined [134] in addition to other minerals. The bulk of the mountain range is covered with thick forests. Only a few bare gol'tsy project beyond these forests in the eastern part, and only higher Alpine forms project beyond the tree line in the western part. The composition of the forests is strongly influenced by climatic conditions. On the slopes inclined toward Baykal and exposed to the damp and cool northwest winds there is typical Siberian taiga with larches, Siberian stone birch, pines, and others. On the dry southeastern slopes, on the contrary, pines predominate almost exclusively. The flat ridges are covered by an underwood and bush formation.

The Khamar-Daban is separated from the Borgoyskiy Mountain Range on the south by the valley of the Temnik, which flows down to the Selenga. The Borgoyskiy Mountain Range runs parallel to the Khamar-Daban and generally has the same character except for the fact that toward the south it is more heavily broken up /zergliedert/ and with wide, open valleys declines to the extensive graben depression of the Dzhida. In contrast to the Khamar-Daban and the Borgoyskiy Mountains, which are difficult to traverse and not very attractive because of their forest wilderness, the Dzhida valley is relatively well opened up. This goes back to the valley's valuable natural resources. [135] In the area around the upper course of the river there is, in addition to coal, rich supplies of wolfram and especially of molybdenum. These deposits can be reckoned among the richest in the Soviet Union.

[1] [cf. pp. 238-239--Analyst]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1019
Lena
Shigalowo
1145
54
Irkutsk
Baikal-See
Primorskij-Geb.
Baikal-Geb.
Barguzin-Geb.
Barguzin
Ikatskij-Geb.
Angara-Geb.
Syn...-Geb.
Deljun-Uranskij-Geb.
Nördl. Muja-Geb.
Südl. Muja-Geb.
Zipikan
Witim
Witim Plateau
Amalat
Vulkane
Muschketow
Obrutschew
Lopatin
Turka
Ulan-Burgasy
Kurba
Uda
Chudunskij-Geb.
Ulan-Ude
Chamar-Daban
Tsagan-Daban
Tsagan-Churtej
Jablonowyi Gebirge
Karenga
1576
Tschita
Ingoda
Tscherskij-Geb.
Daurisches Gebirge
Borschtschowotschnyj
Gasimur
Ergun
Onon
Kjachta
Dshidinskij
Chilok
Malchanskij-Geb.
Selenga
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2508
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Sketch Map of Transbaykal; Orographic Scheme.

Section B.

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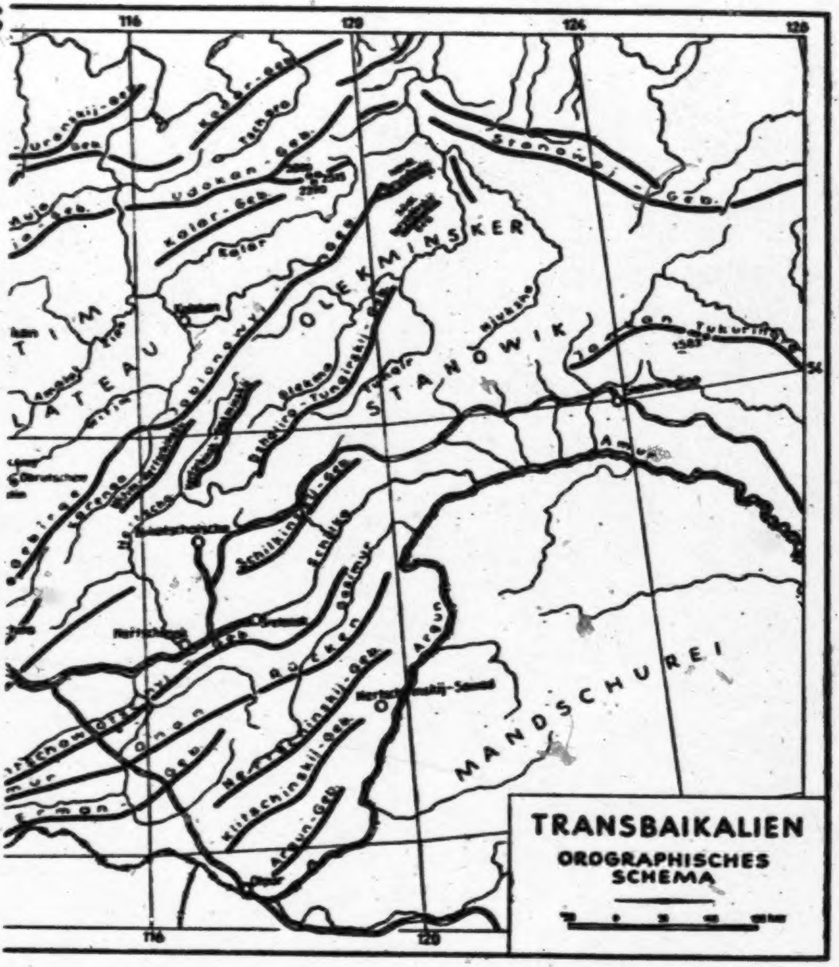
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-Urenskij-Geb.
Kodar-Geb.
Tschara
Udokan-Geb.
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Aujo-Geb.
Kolar-Geb.
Kolar
OLEKMINSKER
STANOWIK
Stanowoj-Geb.
Tukuringra
1583
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Amur
PLATEAU
TIM
Amalat
Jablonowyj-
Witim
Jarenge
Bankiro-Tungirskij-Geb.
Bliekme
Tungir
Schilkinskij-Geb.
Schilka
Nertschinsk
Gasimur
Rücken
Argun
Nertschinskij-Sawod
Nertschinskij-Geb.
Onon
Kiltschinskij-Geb.
Argun-Geb.
Ermon
MANDSCHUREI
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TRANSBAIKALIEN
OROGRAPHISCHES SCHEMA

Sketch Map of Transbaykal: Orographic Scheme.

deposits can be reckoned among the richest in the Soviet Union. Thus, 133
here in the middle of a remote wasteland a small industrial area has [361]
come into being, whose center is the town of Gorodok and which already
has more than 10,000 inhabitants. The center is a large wolfram- [316]
molybdenum works with modern mines, ore dressing installations, conveying and suspension railroads. The valley slopes here are still grown over by thick taiga. However, toward the east the forest withdraws from the lower slopes, which appear far from one another and form an extensive grass steppe area, which merges with the Selenga steppe without interruption. The valley of the Dzhida is bordered on the south by the Dzhidinskiy Mountain Range named after the river. The Mongolian border runs along the watershed of this mountain range.

The Khamar-Daban continues toward the east with dimensions which become smaller morphologically and geologically. However, the Selenga, which breaks through the mountain in a narrow valley, is usually considered to be the eastern border of the Khamar-Daban. The Selenga circumscribes the eastern part of the Khamar-Daban and empties into Lake Baykal in a broadly projecting delta.

/213/ /Sketch Map of the Buryat-Mongol ASSR:/

/214/ The Selenga Delta is a heaped up plain /Aufschüttungsebene/ which on the mean lies 7 to 8 meters above the water level of Lake Baykal, to which the delta slopes in terraces. The lower terrace, which already bears sea deposits, is completely flat, while the remaining parts are gently rolling. The northeast, the real present-day delta, is traversed by numerous dead and living arms of the Selenga, while the southwest is flowed through by some tiny little rivers, which come directly from the Khamar-Daban. In terms of its landscape, the delta represents a dry steppe, in whose lower, sunken-in parts swamps are imbedded. The delta is fairly heavily populated by Russians and Buryat, who pursue
both fishing and agriculture. Irrigation is used in the agriculture. The [361]
center of this area is Kabansk, where the railroad coming from the west
touches the Selenga for the first time. The products of the fishing are [264]
stored here in modern cold storage installations and made ready to be transported away.

From here[1] the railroad uses the valley of the Selenga and reaches 361
Ulan-Ude, the capital of the Buryat Republic, above the break-through by the Khamar-Daban. The city lies on the right bank of the Selenga at the mouth of the Uda, which is navigable by rafts. In 1926 still a small, dusty steppe town with 29,918 inhabitants, Ulan-Ude by 1939 had become a modern industrial city with 129,419 inhabitants. In

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[1] [i.e. Kabansk--Analyst]

361 this city almost 25 percent of the total population of the Buryat-Mongol [391] ASSR have been brought together. Ulan-Ude has the largest locomotive and railroad car factory in eastern Siberia; this factory supplies the whole Far East. Supported by the Buryat's important breeding of livestock, [253] the largest meat factory in Siberia, which produces canned meats, frozen meats, and other preserved meat goods has come into existence. The meat plant is in a position to process 400 cattle, 1,000 sheep, and 250 pigs a day. In 1940, 25 million cans of meat were sent out. Two large [323] glass factories make Ulan-Ude also the supply center for crockery and glass goods for the entire Soviet Far East. Lying on a river and a railroad, Ulan-Ude is favorably located in terms of transportation. At the [396] same time Ulan-Ude is also the center of the Selenga water transportation, for which river steamers and barks are built in the city's own dockyard. Steamers not only carry traffic downstream but also carry it up the tributaries, for example on the Chikoy, which runs through agricultural regions. Of no less great importance is the floating of lumber, since the tributaries of the Selenga come from areas rich in forests. Here [313] again the lumber streams into Ulan-Ude, where it is processed in large sawmills. Iliynsk, which lies on the Selenga 57 kilometers below the capital, is also an important wood-processing center.

4/133 Ulan-Ude lies at the point where the Selenga Valley unites with the valley of the Uda. As a contiguous graben depression, the two form a morphological-tectonic unit, and in their natural state, they were once a steppe. /215/ /Sketch Map of the Buryat-Mongol ASSR:2/216/ These two valleys today are the most heavily populated and economically the most important regions in the Buryat-Mongol ASSR.

Above Ulan-Ude the valley of the Selenga soon expands into a hilly to gently rolling, pure steppe landscape, which continues over
487 the border into Mongolia. It is traversed by the old caravan road, which connects Ulan-Ude with the capital of the Mongolian People's Republic, Ulan-Bator, the former Urga. At the border crossing Kyakhta (approximately 10,000 inhabitants) lies opposite the Mongolian Atlan Bulak
491 (Chinese: Maimachen). This overland route, expanded into an auto-
496 mobile highway in the period of the Soviet Union, has since 1938 been supplemented by a railroad line, which branches from the main line at Ulan-Ude but does not follow the old road. Rather it goes around Gusinoye Lake in a western arc and reaches the border at Naushki, approximately 20 kilometers west of Kyakhta. A lengthening of this
491 railroad to Urga was carried out in 1949. A land route usable throughout the year by trucks branches off from Novo Selenginsk toward the west into the river area of the upper Dzhida.

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into the river area of the upper Dzhida.

Gusinoye Lake has the shape of an ellipse, and, having an area of 164.7 square kilometers and a maximum depth of 28 meters, it is the largest lake in Transbaykal. The present lake represents a recent formation. Even in 1720 it did not exist. In 1730 the water began to collect, coming for the most part from the Temnik, which used the Tsagan-Gol as a means of access to the depression. Around 1800 the lake already had approximately its present size. From 1810 the water began to withdraw again: the lake shrank up and numerous flat islands emerged. After 1865 a raising of the water level again set in, which gave the lake its old form again. At present a withdrawal of the water has again been determined. Gusinoye Lake lies in an area of Jurassic sandstones and conglomerates, which are interlarded with layers bearing brown coal. The Gusinoye plain continues toward the northeast and the south and is hemmed in on the west by the Khambinskiy Mountain Range and on the east by the Monostoy Mountain Range. The plain lying south of the lake bears the name of Tamchi. It owes its origin to fluviolacustrine deposits. Prassolov regards it as a delta formation of the Temnik. The main stream of the Temnik empties into the Selenga, but sends a branch, the already-mentioned Tsagan-Gol, into the lake, from whence a side river, the Bain-Gol, flows off and again leads to the Temnik. Accordingly Gusinoye Lake can to a certain extent be regarded as the Temnik's water storehouse. A slight fall in the water level is sufficient to keep any water from flowing off from the lake. The lake has fresh water and is very rich in fish.

Within the Gusinoye plain, interestingly enough, salt lakes in basins from which no water flows off and important deposits of chemical salt have formed: thus, for example, the Tsagan-Nor and the Selenginskoye Lake. The latter is 1.5 kilometers long and up to 1.8 meters deep. The hot summer furthers the concentration of salt in these lakes. Often they lie in a long extended depression /217/ within mighty layers of deposited salt with the present day lakes filling only the deepest spots with their waters. From this it can be deduced that the processes still going on in the present must have been more intensive in the past. These water basins never had a connection with the ocean either in the recent past or in the distant past; rather they are interesting examples of lakes with salt of continental origin. One collected salt which became free as a result of chemical disintegration of crystalline rock; others washed continental sediments in lye, sediments which had been enriched with salt in an older geological period. For this reason the

133 peculiarity of these lakes depends on the rock in which they are set.
If such lakes lie within eruptive stone, they are as a rule alkali, i.e.
they contain and deposit soda (Doroninskoye, Ononskoye, Borgoyskoy
317 Lake). In winter when the climate is dry, soda crystallizes out from
the frozen surface of these lakes while strong winds raise up these soda
crystals from the ice and deposit them in the immediate and distant
environs, thus fostering the mineralization both of the ground water
and also of the surface water. In order to extract soda, the soda crystals,
which look like a white tinge on the ice, are swept together; thereby
20 to 25 tons of highly concentrated soda lye can be gotten from a
hectare of ice surface. In order to foster the crystallization out of the
soda, the ice is beaten open so that the lake water comes out under its
own pressure through the openings and floods over the surface of the ice.
If the lakes lie within Jurassic sediments, then sulphate forms as a rule,
especially mirabilite. Deposited under the floor of Selenginskoye Lake
is a layer, several meters thick, of sulphate of soda, whose supply is
in millions of tons. Alginskoye Lake also belongs in this group. The
railroad from Ulan-Ude to Naushki is supposed to lead to the opening
up of the important salt deposits in the area of the Gusinoye Lake; the
brown coal deposited in the same area is supposed to serve as a basis
for this. A large sulphate plant is already in production. At the
361 Gusinoye Lake station a city with more than 10,000 inhabitants has grown
from an unimportant village. Coal mines from here supply the railroad.
In addition sawmills, brick yards, great dairies, and a fish-canning factory
have come into being there. In the fish-canning factory the catch from
Gusinoye Lake is processed.

133 The steppe regions which appear in southern Transbaykal vary
137 greatly in their economic importance. In the most southerly areas the
artemisian steppe extends over a very wide area: it extends not only
over the valley areas but also over the mountain slopes and mountains
of the mountain ranges, which here are mostly low. In its driest parts
the ground is often covered only 40 percent to 50 percent with plant
growth, and the height of the grasses scarcely reaches 15 to 20 centimeters.
These are poor meadows. Toward the north, through the thickening
/218/ of the covering of vegetation and through the increase in the
grasses, this type of steppe gradually changes into the artemisian grass
steppe, in which the grasses become 35 to 40 centimeters high. These
steppes are used as meadows in the spring and in the first half of the
summer--as long as the vegetation still hasn't withered away under the
summer heat. Both types of steppes have developed on chestnut-colored

Both types of steppes[1] have developed on chestnut-colored 133
soil. Within these steppes salt-pans also appear. Further toward the 137
north the soil becomes darker, its humus content becomes greater (3 percent [134]
to 5 percent), it changes into the so-called southern black earth,
which has only a slight thickness and has a carbonate layer lying near
it. The plant growth becomes richer, the contiguousness of the vegetation
covering becomes thicker. These are pronounced grazing areas for sheep
and goats. For large livestock they are still not sufficient. For such
livestock only the meadow steppes can be considered; these meadow
steppes often cover large areas along the rivers. To this category belong
the Selenga steppes and the valleys of the Dzhida and the Uda.
A similar change in the character of the steppes takes place in the
direction of the individual mountain chains, with the various types of
steppes surrounding the mountain ranges in Isohypsen /isohyetal?/ contours.

The principal importance of the Selenga steppes lies in livestock 231
breeding, which is intensified by the breeding of valuable breeds. The
most important regions here are the areas left of the Selenga and the
already mentioned valley of the Dzhida. The old yurts of the Buryat 242
have disappeared, and in their place small, permanent, modest wood
houses have appeared which in long rows surround the kolkhoz buildings
of the concentrated livestock economy. However, in the less favorable
grazing areas, as in the Kundara steppe east of Kyakhta, the old Buryat
life has been retained. For processing the resulting skins, a rather large 282
leather processing plant has been erected here on the middle Chikoy
under the name of Chikoyskiy Zavod. This plant also draws its raw
materials from Mongolia. The cultivation of grain is more in the foreground 241
in the other regions on the right side of the Selenga, especially
on the lower courses of the Chikoy and the Khilok.

The broad steppe valley of the Uda is the second most important 231
animal breeding area in the Buryat-Mongol ASSR, especially since here
numerous Russians have been drawn into animal breeding. In the area 361
around the upper course of the Uda, in the region of the Yeravninsk
plain, which is rich in lakes, numerous Russian villages have come into [234]
being in which, in addition to slight agriculture, excellent dairy farming
is pursued. The largest localities in this region are Gunda and Sosnovo-Ozerskoye.

East of the Selenga, rising from its delta, is the mountain ridge 133
of the Ulan-Burgassy, which forms the watershed between the Uda and
the Turka, which empties into Lake Baykal. This mountain range is
broader than the Khamar-Daban and has a marked plateau-like surface

[1] [i.e. artemisian and meadow steppes -- Analyst]

133 which is covered with boulders and overgrown with bushes. From this plateau only a few rocky peaks extend above 1,600 meters. The bulk of it is covered with thick taiga. Adjoining it /219/ on the northeast is the Ikatskiy Mountain Range, which flows into the Vitim Plateau.

To the west of the Ikatskiy Mountain Range and separated from it by the broad depression of the Barguzin Valley, the Barguzin Mountain Range rises, which accompanies Lake Baykal to the northern end of the lake. The Barguzin differs sharply from the other mountain ranges in Transbaykal in its Alpine forms and its snow-covered peak, with individual mountains rising more than 2,300 meters above the Barguzin Valley and reaching an absolute height of up to 2,701 meters. In many parts of the mountain range, especially in the north, there are traces of an old glaciation: trough valleys, numerous lakes with a fjord-like appearance, etc. From these lakes project mighty drift blocks. Toward Lake Baykal the mountain range slopes down slowly, but toward the Barguzin valley it declines very sharply and steeply. Toward the Barguzin valley the mountain range character is also best stamped on the range. Here steep rock walls rise almost perpendicularly, projecting beyond the tree line, while typical taiga with very thick underwood covers the lower slopes. All this makes the Barguzin Mountain Range very difficult to gain access to. Some of the passes which exist can only be used by skilled hikers. It is therefore no wonder that in the Barguzin Mountain Range untouched nature has best been preserved, and even today this mountain range is still rich in valuable fur-bearing animals. Even the harshly persecuted sable has found a refuge here. The southern part of the mountain range, bordering on the village of Sosnovka on Lake Baykal, has been declared a national preserve.

The picturesque Barguzin Valley stretches for around 300 kilometers between the Barguzin Mountain Range and the Ikatskiy Mountain Range. In places the valley is up to 30 kilometers wide. In terms of its landscape it is divided into three parts. Thick taiga and numerous clearings, extending over the alluvial plains and covered with high grasses, are characteristic of the upper part of the valley, which extends as far as the mouth of the Garga. The central part, extending to the locality of Barguzin, consists primarily of sand with irregular surfaces traversed by dunes. Embedded in these sands are numerous swamps and lakes, and the rivers form a network of arms. Vegetation here is extremely poor and has a steppe character. The rocks projecting from the sand plains show traces of desert-like disintegration, indeed even aeolian sand erosion and other forms caused by wind such as otherwise are

peculiar only to dry climates. At the foot of the Ikatskiy Mountain 133
Range numerous warm springs bubble up; these springs contain above [312]
all sulphates. In addition there are mineral lakes, which, like the [135]
Alginsk lakes, lies in a basin of sulphate of soda of significant thickness.
Below the locality of Barguzin the mountains come right down to the
river and shut off the extended valley basin. Here begins the third
part of the Barguzin Valley, the breach valley of the Barguzin toward
Lake Baykal. On the right side the mountains press forward right to
the river and present picturesque, alluring landscapes. On the left
side, on the other hand, the mountains withdraw more or less /220/,
making free a flat area along the shore. This landscape on the lower
course of the river accompanies the river for almost 40 kilometers.
Thus the Barguzin Valley presents an extremely remarkable landscape.
Epsom salt lakes between alluvial swamps and lakes in the valley basins
of rivers rich in water; wide development of sands with dunes and steppe
vegetation; traces of desert-like disintegration; permafrost; warm springs;
thick taiga on the circumference; snow-covered mountains in the
background: all this shows a heaping up of contrasts such as is un-
doubtedly rarely found on the earth. The area around the upper course [135]
of the Barguzin has alluvial sands rich in gold. For the rest this area
is traversed only by Tungus reindeer breeders. The other part of the [361]
valley basin is an island of settlements in the middle of uninhabited
mountain forests. Numerous Russians and Buryat here devote themselves
to the breeding of livestock and to very considerable agriculture with
irrigation. The rivers coming from the side valleys of the mountain
range are used especially for the irrigation of the fields. The center
of the main area of settlement is the village-city of Barguzin, which
always has several thousand inhabitants. This city lies on the river of
the same name. The Barguzin River is also navigable from here down
and, via Lake Baykal, it represents the sole connection with the out-
side world.

Just north of the mouth of the Barguzin the Svatoy Noz Peninsula adjoins the land. This peninsula forms an island which is 55 kilometers long and is transversed by two mountain ranges which are up to 1,587 meters high. Only later is this island joined to the shore by a flat narrow piece of land. The material for this is supplied by the Barguzin, the heaping up and the alluvium provide for the current and the waves of Lake Baykal. The original view that the peninsula is a continuation of Ol'khon Island has shown itself to be incorrect, as Busch has shown. On the contrary Ol'khon Island is an underwater ridge running to the

/33 northwest of the peninsula and separated from the peninsula by a channel. The Ushkani Islands northwest of Svatoy Noz, on the other hand, rise on this ridge and consist of the same stone as Ol'khon Island.

South of the Uda valley depression there next follows in parallel strips, running in the direction of Lake Baykal, the ridges of the Tsagan-Daban and the Khudunskiy Mountain Range, then--beginning in the west on the Khilok--the Saganskiy Mountain Range and the Tsagan-Khurtey, which is bordered on the south by the broad valley of the Khilok. The railroad follows the upper part of the Khilok. Between Khilok and Chikoy there then rises the Malkhanskiy Mountain Range which on the east flows into the Yablonovyy Ridge. All the valley depressions, such as that of the Uda, the Khilok, and the Chikoy, which on the west over a great width melts into the Selenga steppes, put on a different face the farther one goes to the east. The differences in height between the bottom of the valleys and the ridges become smaller, the slopes become flatter, the mountain forms become round, often with almost flat watersheds. The bottoms of the valleys lie at 850 to 950 meters above sea level, the passes have a height of 1,000 to 1,150 meters, and the peaks are 1,200 to 1,400 meters high. Toward the east the climate becomes markedly more contrary and damper, and accordingly the bottoms of the valleys /221/ show signs of increasing swampiness.
361 Correspondingly the population, which is limited almost exclusively to the valleys, also decreases toward the east. Because of the railroad line the valley of the Khilok is the best inhabited. In this connection Petrovsk-Zabaykal'skiy should be mentioned. It lies on the railroad line coming from Ulan-Ude on a section between the Saganskiy Mountain Range and the Tsagan-Khurtey and has the largest single foundry [3x] in Transbaykal. The iron ore is delivered by the mines of Balyagansk northwest of Petrovsk, and the coal comes from Tarbagatay and Khalyarta in the valley of the Khilok. All three localities lie not far from Petrovsk and are connected to the main line by railroads. The valley area of the upper Khilok and that of the Chikoy are distinguished from the other regions in Transbaykal by the fact that in these valleys summer rye is well cultivated as grain for bread, while otherwise the cultivation of wheat predominates.

Apart from the above-mentioned coal mining localities, the city-like settlements of Khokhotuy and Bada, known for their processing of lumber, and also Khilok and Mogzon lie on the railroad line east of Petrovsk-Zabaykal'skiy and still in the valley of the Khilok, which flows into the Selenga. Khilok and Mogzon have, in addition to food industry, metal and machine factories. East of Mogzon the railroad crosses the Yablonovyy Ridge and enters Nerchinsk Daur.

Nerchinsk Daur

The Yablonovyy Ridge, which is among the best known mountain /33 ranges in Transbaykal, forms the boundary between the two Daurs. The Yablonovyy Ridge forms the watershed between the rivers flowing into the Amur and those flowing into the Selenga, and thus in the broadest sense it separates the sphere of rivers flowing into the Pacific from the sphere of rivers flowing into the Arctic Ocean. However, this applies only to its southwestern part, for above the Chita River the Yablonovyy shoves in between the Vitim and its tributary the Karenga, and further to the northeast it divides the river area of the Vitim from that of the Olekma, all of which flow toward the north to the Lena. In addition, [237] the Yablonovyy Ridge forms a remarkable climatic and plant-geographic border. The influences of the east Asiatic monsoon penetrate as far as this mountain range and permit deciduous trees to flourish here as representatives of a more moderate climate. West of the ridge deciduous trees are lacking. In this connection the height of the ridge is not so significant as to permit such an influence to be expected.

The Yablonovyy Ridge generally attains a height of only 1,200 to 1,300 meters. Its highest point, which is 1,670 meters high, is the Sarakan, which lies northeast of Chita and which as a golets projects alone from the otherwise very monotonous surface. The relative differences in heights between the valley depressions and the ridges are, however, only insignificant. The railroad crosses the mountain range west of Chita at the Yablonovaya station at /222/ a height of 1,050 to 1,070 meters. The pass here lies only 105 to 125 meters above the valley of the Khilok on the northwest but it is 305 to 325 meters above the bottom of the valley of the Ingoda with the decline to the Ingoda valley also being shorter and steeper. This asymmetrical structure with a steeper southeastern slope and a flat northwestern slope is a characteristic of almost all the mountain ranges in Transbaykal. Obruchev explains this contrast by the effects of the frozen earth by means of solifluction and heavier erosion. The ridges themselves also appear little in the picture of the landscape. From the valley of the Khilok the slope rises slowly to the watershed, which appears to be an almost level rampart. The ridge itself is a more or less plain which is covered with thick forests. Sunk in this plain are saddle-like hollows taken up by swamps. From

133 these hollows, as a rule, the rivers find their origin.

Southeast of the Yablonovyy Ridge and its western continuation,
the already-mentioned Malkhanskiy Mountain Range, there extends
the rather wide valley of the Chikoy and of the Ingoda, which is for
361 the most part settled by Russians. Here the Russian villages lie along
the rivers like pearls on a string, while only a few kilometers away
there stretch mountain forests which are still uninhabited. The best
connections to these areas of settlement are from the railroad stations
of Khilok and Mogzon.

The capital of the region, Chita, lies at the point where the
Chita River flows into the Ingoda. After the construction of the rail-
road line, Chita quickly developed from a small town into a large
city, which by 1939 already had 102,555 inhabitants, and at present
its population probably already exceeds 150,000. The city is built
on both sides of the river of the same name, and, lying 660 meters
above sea level, the city rises like an amphitheater on two terraces
of the land rising toward the north. It lies in a dry, healthy region.
Chita constitutes the economic center of the entire region. It is es-
pecially known for its fur and leather processing. In addition, there
are concentrated in the city important flour mills, saw mills, and
[316] rather large repair shops for locomotives and railroad cars. A few
kilometers west of the city lies the Chernovskiye Kopi, one of the
[317] most important coal districts in the area. Natural calcinated soda is
extracted from the Doroninskoye Lake, which lies further up in the
valley of the Ingoda.

133 From Chita the Ingoda breaks through on the southeast first the Cherskiy Mountain Range and then the Daur Mountain Range, and, then again bending in the direction of Lake Baykal, it finally follows the depression between the Daur Mountain Range and the Borshchovochnyy Mountain Range. In this depression the Ingoda unites with the Onon, which comes from the south. These two rivers then form the Shilka, the left source river of the Amur.

Approximately 60 kilometers below the point where the rivers flow together, and at the Nercha which flows into the Shilka from the north, is the city of Nerchinsk (28,000 inhabitants), and 85 kilometers further down lies Sretensk. Here the well-known Nerchinsk steppe island stretches on the left side of the Shilka, principally between the Shilka's two tributaries, the Nercha and Kuenga. /223/ /Sketch Map of Chita Oblast:/ The bulk of this steppe island consists of an almost ideal plain. The rest of the steppe island is gently rolling with gentle rises toward the edges. In the ground lies a granite /33 foundation, over which is liparite and tuff, covered over by a thick layer of lacustrine deoposits, which point to the formation of the steppe basin from a former lake (Gladtsin, 69). Striking is the present day dryness, which forms a sharp contrast to the forest landscapes surrounding the steppe island. The low position (620 to 680 meters above sea level) as a depression between the contiguous mountain chains, may well be the reason for the special climatic conditions prevailing here. The fertile steppe soil, in many cases designated as black earth, has lead to thick settlement, and, accordingly, the grass steppe only rarely now shows itself in its original dress. The levelness of the steppe is interrupted only by flat, mostly dry valleys with gentle slopes. /224/ In the deeper places there appear damp meadows, often swamps, and also not uncommonly even salt-pans. The slopes of the valleys sloping [137] to the north are overgrown with birches, poplars, meadows, and bushes, especially if the valleys have the character of a ravine. The transition to the forest landscapes occurs quickly. However, the souther slopes remain free of forests the longest and often appear in contiguous taiga as small forest steppe islands. Toward the Shilka the steppe plain breaks off with a steep, heavily valleyed, high step, which from the river often gives the impression of a mountain land. Next to the dairy and meat economy, the cultivation of grain stands in first place in the agriculture of the steppe island. The economic center is Nerchinsk [361] with its mill plants, brandy and alcohol distilleries. In terms of transportation Sretensk has a better location, for there the regular Amur shipping begins. West of Sretensk in Kokuy there is a shipyard.

The Transbaykal Railroad runs from Nerchinsk on further on the 496 left shore of the Shilka as far as Kuenga, and from here a branch railroad leads to Sretensk. The main railroad line, which from here on bears the name of Amur Railroad, leaves the Shilka Valley at Kuenga and circumscribes the Shilkinsk Mountain Range in a great arc. Here 316 in the north, lying in a side valley of the Kuenga and connected by a railroad line, are the coal mines of Bukachacha, which in their production stand in first place in Transbaykal, and farther to the east around the Mogocha station lie extensive gold fields.

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69. Gladtsin, I.N., Geomorfologicheskii ocherk Zabaykaliya /Geomorphological Sketch of Transbaykal/, Trudy of the Geographical Institute of the Academy of Science, (Moscow, 1938), p. 174.

000 around the Mogocha station lie extensive gold fields. Thick taiga /37 lightly inhabited here[1] crosses over all types of land. The raw climate is already strongly perceptible. Permafrost sets in already at a depth of 1 meter. The increasing swampiness of the lower places, and the increasing appearance of gol'tsy which are bare or covered only by bent wood vegation /Krummholzvegetation/, show that here we already find ourselves in the transitional area to the raw forest landscapes of the north.

● /38 The Baykal Cherskiy Mountain Range accompanies the Yablonovyy Ridge on its southern side and goes in the same direction as the Yablonovyy. East of the Ingoda break-through, the broad, swampy valley of the Chita River forms the border. Then the Cherskiy Mountain Range extends further still to the northeast into the still little known regions around the source of the Nercha. It is to this area, in the opinion of Vosnessenskii, that the 1,971 meter and 2,091 meter high Kropotkin Mountains belong. The course of the Daur Mountain Range, which adjoins the Cherskiy Mountain Range and runs in a parallel line to it, is still not fully clarified. Since the border between the two mountain chains is very vague, the two ranges are often referred to by Russian authors as one range, either under the first or the second name: In the break-through valley of the Ingoda the two mountain ranges can be recognized as separate units. Two tributaries of the Ingoda, the Olenguy on the right and the Kruchina on the left, divide the overall massif. Further toward the east the Daur Mountain Range remains on the left side of the Ingoda and Shilka, crosses /225/ the Nercha and, in the opinion of Gladtsin, could continue into the Shilkinskiy Mountain Range. In their gently rolling surface forms the two mountain ranges show their original form to be almost level. With the later elevation this original plain has been far more valleyed and divided up through increased erosion that the Yablonovyy Ridge has been; and, accordingly, watershed areas in some parts have disintegrated or show a course that is often very winding.

The Borshchovochnyy Mountain Range, the next mountain ridge to the southeast, is to be regarded as the last typical Baykal mountain chain. The Borshchovochnyy begins in the area around the upper course of the Ingoda and of the Onon on the Mongolian border and stretches almost 1,000 kilometers to the east-northeast. With this mountain range, too, the eastern part of its course is more marked and better known that the western part. Immediately after the break through in the Daur Mountain Range, the Borshchovochnyy forces the

[1] [i.e. Shilkinsk Mountain region --Analyst]

Ingoda to turn to the east and then follows the river in the same direction. In a chasm the Onon here breaks through the mountain range from the south, but the ridge remains on the right side of the Shilka and, bordered on the south by the Gazimur, reaches the Argun where it runs into spurs of the Great Khingan. Thus two tectonic lines meet here at a sharp angle. The surface forms generally have the same character as on the above-mentioned mountain chains. The breaking up into valleys is especially prominent in the eastern part, along the Shilka and toward it, since here, following the usual picture in the Baykal area, the southern slope toward the Gazimur is short and precipitous, and, accordingly almost all the rivers are directed toward the Shilka. In the vegetation picture, too, the Borshchovochnyy Mountain Range still shows the full, thick forest covering; only south of Chita does the steppe penetrate even to the ridge of the mountain.

Toward the southwest, in the area between the long valley of the Ingoda and the Chikoy on the one side and the Onon on the other side, all three mountain chains--the Cherskiy, Daur, and Borshchovochnyy mountain ranges apparently flow together, according to knowledge to date. No sharp borders can be drawn here. The Borshchovochnyy Mountain Range, however, has the principal role here, for it carries the main watershed between the waters flowing off to the south to the Onon and the rivers heading toward the north to the Chikoy and the Ingoda. The Cherskiy and Daur Mountain Ranges, on the other hand, are broken through and divided into individual parts, not only by the upper courses of the Chikoy and the Ingoda but also by their numerous tributaries. The entire area covering the region around the upper course of the Ingoda, the Chikoy, and the Onon, has, in contrast to the rest of Transbaykal, a peculiar physical-geographical character. This area is a mountain land with numerous heights, which extend far beyond 2,000 meters. The best known mountain is the Sokhondo, which is 2,508 meters high. It lies on the main watershed in a mountain chain, whose highest elevations all reach between 2,243 meters and 2,332 meters. However, as Gladtsin (69) /226/ reports, north of

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69. Gladtsin, I.N., Geomorfologicheskii ocherk Zabaykaliya /Geomorphological Sketch of Transbaykal/, Trudy of the Geographical Institute of the Academy of Science (Moscow, 1938), p. 169.

this series of heights mountains have been found which are not inferior

133 in height. Thus the Barun-Shebetuy golets, which lies between the Chikoy and its tributary the Chikokon and which is 2, 556 meters high, is taller than the Sokhondo, which formerly was considered to be the highest mountain in Transbaykal. Because of their location away from everything and because of the difficult access to these uninhabited regions, they are still very little known. However, the research of Dengin gives a general picture of the landscape, which does not differ from the rest of Transbaykal in its geological-morphological history. The Barun-Shebetuy and also the gol'tsy neighboring it, like most of the mountains in the Sokhondo series, also have a flat surface, and the rest represents a strongly elevated area which is almost a plain. The present-day relief is the result of a very heavy erosion with an important role having been played by the glaciation in the Quarternary period, which is indicated on the Sokhondo by Kare /Karst?/, trough valleys, and moraines and which apparently also gripped the other mountains, which are no less high. Therefore, the same thing has resulted here as is shown by the morphological relationships in the western part of the Khamar-Daban and in the bulk of the Barguzin Mountain Range: everywhere that the diluvial glaciation has gripped a place, the elevated peneplain parts have experienced a much stronger shaping into mountain-like forms, indeed a shaping almost into the Alpine type, than the other areas. Of special morphological significance for the area around the upper course of the Ingoda, the Chikoy, and the Onon, is, in addition, the mighty appearance of intrusive rocks from the Paleozoic to the upper Mesozoic periods and also the appearance of effusive rock such as porphyry, dazite /Daziten/, andesite, and basalt of varying age. These rocks, because of their varying resistance, have contributed significantly to the differentiated shaping of the relief. From all this it is clear that the present-day relief does not correspond with the geological-structural formation and its direction by reason of the prevailing erosion processes of the past and present. The slopes of the [137] mountains are as a rule covered with thick forests. Only on the sides facing south are there treeless steppes, especially, naturally, on the extreme slope facing Mongolia. Pure steppe, for example, crosses the foot of the Sokhondo to a height of 1, 200 meters. Birches and aspens, soon joined by pines, constitute the transition to the raw mountain taiga, in which larches and Siberian stone birch predominate. From 1, 900 meters on, the transition to mountain tundra begins via bent wood vegetation. As a consequence of mighty storms, the windfallen wood is very heavy. There are Russian settlers only on the outer

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[361]

There are Russian settlers only on the outer edge of the region[1] in the valley plains of the main rivers; the entire, vast interior, on the other hand, is completely uninhabited.

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The Manchurian Railroad branches off from the Karymskoye station between Chita and Nerchinsk. This railroad strikes the direct route to Vladivostok via Harbin. The last Soviet Russian station is Otpor, which /227/ lies opposite the Manchurian border. The railroad runs directly to the southeast and, in the process, crosses over all the mountain ridges almost at a right angle. After the Borshchovochnyy Mountain Range, there follows the Gazimur-Onon ridge, which reaches south of the Gazimur River to the Argun, and then the Erman, Nerchinskiy, Klichinskiy, and finally the Argun mountain ranges. All these mountain ridges run in the direction of Lake Baykal and run almost parallel to one another. The Gazimur-Onon ridge extends along the middle course of the Onon on the north side of the river until the break through of the river. The Gazimuro-Onon ends on the Argun between the Gazimur on the north and the Uryumkan on the south. It is never over 1,000 meters high. The Erman Mountain Range is already divided into two parts by the Tarey Basin which has no outlets. In the picture of the landscape of the entire region a gradual change is apparent from northwest to southeast, and also one from northeast to southwest.

From northwest to southeast, i.e., in the direction of the Manchurian Railroad, the ridges gradually become lower, the differences in height decrease. The coniferous forests and likewise the swamps disappear. A striking wealth of birches enters, covering first the ridges, then only the northern slopes, and finally making way for the pure steppe. In the process salt-pans can already appear in the depths.

To the northeast, toward the Argun, all the mountain chains become higher, the Erman Mountain range reaching up to 1,400 meters, the Nerchinskiy Mountain Range reaching up to 1,300 meters, and the Argun Mountain Range reaching 900 to 1,000 meters. In the regions whose waters empty into the Argun, especially in drainage areas of the Gazimur, Uryukan, and Urov, the land has the character of a medium mountain range with peaked heights, deeply etched river valleys, and larger relative differences in height (300 to 500 meters). The undeveloped water network with great drops and numerous stony current rapids and waterfalls points to a recent elevation of this region, whose landscape can be designated as the Argun type. Toward the southwest the absolute height of the ridges decreases, the relative differences become smaller (100 to 150 meters on the mean), the valleys become wide, the rivers form great arcs and numerous meanderings.

[1] [i.e., in the area between the valley of the Ingoda, Chikoy and the Onon -- Analyse]

/133 Side erosion predominates. Gradually the ridges dissolve into hills. This landscape, designated by Presnyakov as the Gobi type, takes up the entire southern part of the Argun region. Here are the mountain steppes of the Onon and Argun. The Tarey Basin, which is also designated as Onon plain by Russian geographers, should be named as the third province. The Tarey forms a basin with no outlets and extends beyond the Mongolian border as far as the Kerulen. In the center lie the Tarey lakes, of which various ones cover a significant area. Thus the Barun Tarey covers 435 square kilometers, and the Sun Tarey covers 300 square kilometers. The countryside is for the most part level and is interrupted only by former river valleys and lake basins which are now dry. The /228/ remaining lakes lie 60 to 70 meters below the general surface, i.e. at an absolute height of 620 meters, but they are always still up to 5 meters deep. Despite the clear signs of recent drying up, water springs appear in many places on the surface. These springs form the centers of human life. The steppe character often gives way already here to wasteland forms.

The border between steppe and forest extends from Aksha on the middle Onon via Il'inskaya to the north to the watershed between Aga and Ingoda, then on the Ingoda to the east to the mouth of the Aga. From here the border circumscribes the Argun mountain country in an arc swinging to the south via the localities of Onon-Borzya, Akatuy, and Algachi. The border then turns again toward the northeast via Nerchinskiy-Zavod to the Argun.

Southeast of Chita there begins the Aginsk steppe, a true grass steppe, which takes up the river area of the Aga and the middle Onon. [231] Here lies the national oblast of the Buryat, who have made the area into an important livestock-breeding region. The Argun steppe takes up the entire southeast, where livestock breeding likewise dominates the economy. But here there are Russians, who pursue the breeding of cattle and sheep in large, specialized, state farms. In addition, there are also some state farms for horse breeding. [241] To the north of both steppes agriculture, with wheat as the main product, is diffused over a large area, and in a broad front it penetrates to the south. [361] Along the great rivers and also along the Argun the villages extend in a line through the middle of the steppe. The diffusion of agriculture [134] is favored by the circumstance that, despite the often very poor steppe vegetation, a horizon very rich in humus, a type of black earth, has developed under the pitted grass /Grasnarbe/.

000 The wealth of natural resources is, however, of far greater

The wealth of natural resources is, however, of far greater 135
significance for the economic development of the future.* In this 489
connection the non-ferrous metals in addition to iron ore should be mentioned primarily. The still insufficient connection with the transportation network, however, offers the greatest handicap to the exploitation of the natural resources. Apart from the railroad line which runs from Karymskoye to Otpor to Manchuria, there are only land routes available. Even the very important zinc-lead mines in Khapcheranga, in Mangut, and on the Sokhondo can be reached from the Ulstuy station, west of Karymskoye, only by a built-up land route which is around 320 kilometers long. And by the same route, too, the produce of the mines must be brought to the railroad line on trucks. Because of the smaller differences in height the land route along the Onon valley to the Olovyannaya station has recently been used in perference to the above-mentioned route, which crosses more mountain ridges. Also the regions in the angle between the Manchurian side branch of the railroad and the Argun can only be reached by built-up land routes
and truck transportation. Borzya on the railroad line appears to be 361
developing here into the traffic center. Toward the east a narrow-gauge railroad leads to the /229/ non-ferrous metal mines of the Argun district, and toward the southwest a similar line leads to Choybalsan in the Mongolian People's Republic. The city itself, located in the middle of the Argun steppe which is rich in livestock, has a large meat plant. In addition to Borzya there should also be mentioned on the Manchurian branch of the railroad the city of Olovyannaya, which has already been mentioned several times and which is known for its tin works. The bulk of the other localities have already been listed in the discussion of the natural resources.

*[i.e. of the Aginsk steppe -- Analyst]

The Vitim Plateau and the Northern Forested Mountain Provinces

To the north of the Yablonovyy Ridge, spreading east of the 123
Ikatskiy Mountain Range, is the Vitim Plateau, which is adjoined on the north by a series of mountain ridges. The entire region represents a forest mountain range landscape, which climatically is very raw and which makes it very difficult for man to make his way here. Agriculture disappears almost entirely here or is limited to small islands which are scattered sporadically. Only Tungus hunters and reindeer breeders in small numbers traverse the thick taiga and pass a laborious
life. However, these wastelands conceal extraordinarily rich gold 316
streams, which are diffused especially in the central part of the Vitim Plateau and which have brought into being active gold

316 mining. Accordingly, these parts have been best explored and are best known.

/299/ /Sketch Map of the Vitim Plateau and the Northern Mountain Forest Provinces/[1]

● 133 /230/ Here in the northeastern continuation of Transbaykal, the characteristic morphological traits are also clearly marked. There are old root plains, which are dissolved into horsts and grabens by breaks, with contiguous mountain ridges and wide valley plains appearing in addition to wide, gently rolling, high plains which have only mountain cores projecting above them. The old disturbance lines running toward the northeast in the Lake Baykal direction also traverse this area and determine the essential border lines of the morphological units. Accompanying the metamorphic and mass rocks of the Archeozoic era, there are already here more recent sediments, and above all very frequently there are large basalt coverings, which are of decisive importance for the surface structure of various regions. The Ice Age has been influential in the morphological shaping in places, and has heaped up large moraines in the valleys. Generally the phenomena of frost and solifluction appear far more often than in the rest of Transbaykal.

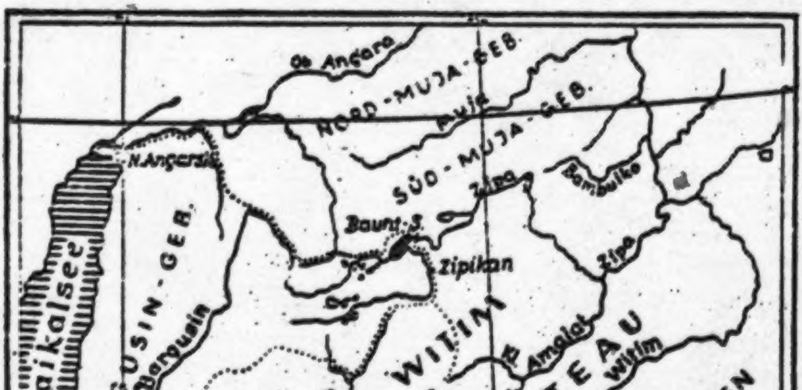
The Vitim Plateau is formed from the growing together of the Transbaykal mountain ridges stretching there from the southwest. The bulk of the plateau is bordered by the Vitim itself. This river flows first toward the south, then turns sharply toward the northeast and then toward the north-northwest. The interior of the high plain is drained by tributaries of the Vitim, principally by the Tsipa and its tributary, the Amalat.

The plateau represents a monotonous high plain, traversed by flat-sloping embankments; between these embankments there are swampy plains covered by thick larch taiga. These plains often extend over ten kilometers and more without the slightest change. The little tiny rivers flow in flat, open valleys; larger rivers, on the other hand, have sunk 40 to 50 meters into the high plain with one side, washed away underneath, often appearing to be steep and rocky, while the other side extends as a damp, swampy plain, filled with small lakes. At present, side erosion predominates in all the valleys. The watersheds rise 400 to 600 meters above the bottoms of the valleys, but the watersheds lie at a very great distance from them. The absolute height of the main watershed reaches 1,700 to 1,870 meters with the passes having a height of 1,385 to 1,490 meters ([illegible])

[1] [Cf. cat. 116, p. 261 -- Analyst]

3: Thiel--261 K-4,5(no date) 1953 [illegible] Siberia RR1

Sketch Map of the Vitim Plateau and the Northern Mountain Forest Provinces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BARGUSIN-GEB.
Baikalsee
Bargusin
Sosnowka
WITIM
PLATEAU
Kl. Amalat
Gr. Amalat
Witim
Zipa
Witim
JABLONOWYJ-RÜCKEN
Bargusin
Romanowskoje
Nertscha
50
100 km

133.

(Gladtsin, 69). Between the Tsipa and the Amalat, i.e., in the 133

main division line, the watershed, however, projects only 360 to 450 meters over the general height of the surface; but with the flat slopes even their highest places differ only slightly from the surroundings. "Somewhat fewer grasses, in their place more moss, less green and fewer branches of larches, the appearance of low-growing birches in larger numbers than in the plains: all these are things by by which one can recognize the higher position of the watershed," says Kropotkin. The river area of the Tsipa is especially uniform in this connection. This results from the slight fluctuations in height along with great expanses in the horizontal lines; in addition, the thick forest covering conceals the irregularities in the surface and rounds off and equalizes the sharper contours. The broad valley areas, covered with swamp meadows, /231/ give way so gradually to rolling land that it is difficult to draw a border since the slopes mostly have an inclination of only 2° to 5°. However, here and there individual mountains with marked contours appear above the general surface. The majority of these mountains consist of granite. Above 1,500 meters these mountains are bare of any form of plant growth and appear as naked rocks studded with mighty blocks and boulders. They are the usual gol'tsy. As a rule they have the form of peaks or embankments; less commonly they have sharper features with the rock being decisive for the form.

Toward the peripheral regions the plateau is more broken up and in places acquires a mountainous character. This applies especially to the area around the upper course of the Barguzin and the Vitim. The southwest, on the other hand, again shows more the level, gently rolling surface. This is explained by the great basalt cover here, which lies over everything. Where this covering does not exist, the relief is sharper and shows more contradictory traits. The diffusion of the basalt is suited to the river valleys with which genetic connections must undoubtedly exist. The border of the diffusion of the basalt runs along the Vitim in the west and south, and in the north it runs along the Great Amalat as far as the meeting of this river with the Lesser Amalat; from here the border then withdraws toward the south to the

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69. Gladtsin, I.N., Geomorfologicheskii ocherk Zabaikalia /Geomorphological Sketch of Transbaykal/, Trudy of the Geographical Institute of the Academy of Science (Moscow, 1938), p.151.

133 Vitim. The basalt covering thus fills almost the entire southwestern corner within the course of the Vitim. Here, too, three typically-formed volcanic cones have been discovered: the Mushketov Volcano; opposite it, on the right side of the Vitim in the vicinity of the mouth of the Kokyrtuya, the Obruchev Volcano; and somewhat above this, again on the left side of the valley of the Vitim, the Lopatin Volcano. The tree cones project approximately 100 to 160 meters above the surrounding area. Even if these volcanos may also have played a role in the formation of the basalt covering, still the greater part of the covering goes back undoubtedly to effusions in cleavages /Spaltenergüsse/. If the basalt covering has also contributed to the level character of the surface and to its maintenance, the rivers have cut deeply into the plateau in those places where they have succeeded in penetrating to the 20 meter thick basalt; accordingly, gorge-like, even canyon-like valleys are especially characteristic for these peripheral regions. These valleys with their rocky walls stand in sharp contrast to the level surface.

The main water veins of the Vitim Plateau follow in their course the tectonic lines. The Tsipa forms not far from the source of the Barguzin. It flows first toward the northeast in a broad valley filled with lakes; then, however, it very suddenly breaks out of this valley, turning to the south, and relinquishes to the Bambuyka the further use of the tectonic valley extending to the northeast. The Bambuyka after a certain stretch likewise breaks out toward the south and leaves the last stretch of the valley free for the Tuldunin, which reaches to the Vitim. The cross-bar which separates the Tsipa and the area around the source of the Bambuyka, consists only of a low hilly country of river boulder alluvium with lakes dug into the depressions. It is from these lakes that the /232/ Bambuyka also finds its origin. Old stone is also supposed to be underneath this boulder barrier. The second barrier between the Bambuyka and the Tuldunin is determined by a granite bar. After its break-out, the Tsipa flows in a gorge-like valley, which in places is narrow but which then later broadens into a wide depression. In this valley the Tsipa runs toward the southeast almost exactly parallel to the Vitim, only in the opposite direction, until it runs into the Amalat forming from the right. As the Great Amalat, this river comes from the southwest and in a broad valley extends toward the northeast approximately parallel to the southeastern border of the plateau and the Vitim which flows there. Although the Tsipa has more water, in the course of this valley it becomes part of and continues the direction of its tributary toward the northeast until it empties into the Vitim. In the Tsipa-Bambuyka valley and in the Amalat-Tsipa valley there are tectonic lines running in the Lake Baykal direction. These lines here are crossed by disturbance lines running southeast-northwest. These lines seem to be indicated by the middle course of the Tsipa and the northwest direction of the Vitim. 133

The valley of the upper Tsipa is indicated as the tectonic continuation of the Barguzin valley. It attains an extraordinary width (up to 25 kilometers and more) and represents the floor of a former important fresh water lake, whose surface, clearly indicated by terraces, lay at 1,129 meters above sea level. The present-day valley basin is taken up principally by peat moors and meadows with clusters of grass, in which a large number of lakes of all sizes have remained as remnants of the former water basin. The largest lakes are Baunt, Busani, and Okunevskiy lakes. Baunt Lake, through which the Tsipa flows, lies at a height of 992 meters. The southern part of this depression, which is rich in lakes, is used by a tributary of the Tsipa, the Tsipikan, whose source neighbors on that of the Vitim. In this area, on the upper Tsipikan and Vitim, lie the richest gold fields in the Vitim Plateau. Toward the east the former lake basin thins out to a narrow valley; and, accordingly, boulder barriers occur easily to stop the Tsipa and force it toward the south. The tectonically determined valley, however, as has already been stated, continues in the same direction toward the northeast and serves as a river bed for part of the Bambuyka and for all of the Tuldunin.

The most important gold regions of the Vitim Plateau are in the upper courses of the Tsipikan, Vitim, and Lesser Amalat; in short, they are deposited somewhat toward the west, almost in the central part of the plateau. The gold streams in large part lie in the permafrost area, and, accordingly, the dressing of the ore and the extraction of the gold takes place with difficulty, even though dredges and mechanical gold washing installations are employed. The supplying of the area causes special difficulty, since supplies must be brought through vast, uninhabited taiga wilderness. To be sure, Baunt Lake supplies fish, meat comes in part from the reindeer herds of the Tungus, potatoes and vegetables are cultivated to a slight extent on the spot, but the outside world must be / 233/ relied on for the rest of the supplies. For this the Barguzin Valley plays the primary role, because the shortest routes, although difficult ones, lead from it to the gold districts. 316

316 *Land road connections also exist toward the south via Romanovskoye*
[491] on the Vitim to Chita. A rapid and continuous means of transportation
[509] has recently been ensured by an airline, which is flown regularly
and which connects Chita with Tsipikan, the center of the northern
gold district.

•133 To the north of the Tsipa-Bambuyka valley rises the Muya mountain country, which is divided into two long ridges by the river of the same name which flows toward the northeast to the Vitim. These two long ridges are the Southern Muya Mountain Range and the Northern Muya Mountain Range. The northern border of the latter is formed by the extended valley of the Upper Angara, which flows toward the west-southwest to Lake Baykal.

The Southern Muya Mountain Range, a mighty, massive horst, forms the watershed between the Tsipa and the Muya. It has a raw, wild appearance with a ridge of numerous gol'tsy, with an entire series of heights, crowned with snow, rising over 2,000 meters. The picture of the entire mountain range, however, is not unified, and the wealth of varying forms is determined by the change in the rock. The former root surface is, to be sure, heavily destroyed, but it is still always recognizable. In the higher places traces of an old glaciation are to be found everywhere in the form of circus /circular?/ valleys /Zirkustäler/, trough valleys, round basin lakes /Karseen/ and basin moors /Karmooren/, and, in the valleys, deposits of boulders and rubble. Because the Muya Valley lies at the slight altitude of 450 to 600 meters, the slope toward the north is much sharper than the slope toward the south to the Tsipa Valley, which generally has a height of more than 900 meters. The passes are difficult, small in number, and 1,450 to 1,700 high. From the swamps at the foot of the mountain range rise slopes covered with thick taiga. Here the ascent into the narrow valleys overgrown with shrubs is especially difficult. Only at heights where the vegetation discontinues, is there an opportunity for free movement.

The valley of the Muya is determined tectonically as a depression. It attains a width of up to 30 kilometers. A mixture of deposits of old and recent date makes the valley plain appear rich in variety. Hills, long embankments, sand bars with closed off lakes, in between swamps and moors displace one another. Terrace formations on the border of the valley and widely diffused lake sediments permit the basin of a former lake to be recognized in the valley.

The Northern Muya Mountain Range, likewise a horst, is

[361]

scarcely to be differentiated from its southern opposite. The valley of the Upper Angara, which opens onto Lake Baykal, has a certain moderation in climate, and accordingly there exist in this valley some agricultural islands occupied by Russians. Otherwise the entire region--apart from hunters and some Reindeer Tungus--is as good as uninhabited. This applies also to the mountain ridges lying farther north, such as that of the Upper Angara, its eastern continuation, /234/ the Delyun-Uramskiy Mountain Range, and the Mama Highland. Only far on the other side of this uninhabited zone, in the southern part of the Patom Plateau on the lower Vitim, are settlements worthy of mention encountered: such as Bodaybo, Leninsk, and Artemovsk, which the wealth of gold there, too, has caused to come into being. But all of these areas already lie outside of Transbaykal and can therefore be mentioned only peripherally. They belong to the sphere of influence of the actual Lena and tend economically toward Irkutsk and Yakutsk.

The Olekma Mountain Country and Olekminsk Stanovik

With this region we encounter vast areas, which are almost uninhabited in most of the northern part and which are still very little explored. Thus even the relationship of the large mountain chains can still not be clearly laid down. Best known still is the most southerly part, which extends as a narrow strip along the Amur and whose waters also empty into the Amur. Thanks to the Amur Railroad, which runs almost parallel to the river at a distance of 50 to 75 kilometers, these sections are also more strongly incorporated in the economy and brought nearer to civilization.

The eastern border of the province is formed by the Olekma, its right tributary the Nyukzha, and the Amur tributary, the Oldoy. The western boundary is clearly marked only in the north by the Vitim; in the south, on the other hand, between the southeastern bend of the Vitim and the Amur, the border is undetermined since the Transbaykal mountain ranges continue here into the Olekma region without interruption.

The Yablonovyy Ridge pushes between the Vitim and the upper course of the Nercha into the area as far as the middle course of the Olekma directed toward the north. The Yablonovyy here stretches on the northern side of the upper course of the Olekma and divides its tributaries from those of the Kalakan and the Kalar, which empty into the Vitim. The Yablonovyy Ridge thus divides the entire province into the Olekma Highland in the north and the Olekminsk Stanovik in the south. Even if the Yablonovyy Ridge, which many geographers consider to end already at the Karenga, a right tributary of the Vitim, continues as far as the Olekma, as Obruchev believes, and ends approximately opposite the mouth of the Nyukzha, it still has no connection, either from a geological or tectonic point of view, with the Stanovoy, which rises on the other side of the Olekma, as is still depicted falsely on many maps. The direction of the Yablonovyy Ridge runs into that of the Stanovoy almost at a right angle, or at least at a sharp angle. The over-all direction of the Stanovoy goes toward the west on the northern end of Lake Baykal and points rather to a connection with the Muya Mountain Ranges, but in no way to a connection with the Yablonovyy Ridge.

The following three mountain ridges in the Olekma Highland are listed from south to north: the Kalar Mountain Range, north of the river of the same name /235/ ; then the Udokan Mountain Range, and the Kodar Mountain Range. While the two latter mountain ranges are separated from one another by the valley of the Chara (flowing to the Olekma) and the Koyurla (flowing to the Vitim), the Kalar and Udokan mountain ranges melt into a plateau more than 2,000 meters high, in the east approximately in the middle between the Vitim and Olekma. Here, south of the area around the source of the Kalar, two mighty gol'tsy on the plateau rise to a prominent height. These are the Golets Skalisty' (Rocky Golets), which is 2,800 meters high, and the Golets Snezhny' (Snow Golets), which is 2,515 meters high. According to present-day knowledge, these gol'tsy represent the highest elevations in the Olekma Highland. A more recent report states that in the same Udokan Mountain range a still higher mountain by the name of Typur has been found, which even exceeds 3,000 meters. But nothing else is known about this mountain.

The Kalar, Udokan, and Kodar mountain ranges consist basically of pre-Cambrian crystalline slate and gneiss, which are penetrated by thick intrusions of granite. Only in the valley areas which separate the mountain ranges from one another, are more recent formations to be encountered; for example, in the valley of the upper Chara continental Jurassic is encountered. Although the three valley depressions are very wide and deep in parts, all three mountain ranges, nevertheless, have a symmetrical connection. The Kodar Mountain Range in the north has a flat northern decline and rises toward the south, where it breaks off steeply at the Chara valley. The Udokan Mountain Range declines 133 steeply on the north and on the south, in short, on both sides, while the Kalar Mountain Range has its steep decline in the north and declines slowly toward the south.

The Kodar Mountain Range, as seen from the Chara valley, represents a single closed mass, its high plain character being clearly recognizable. Through erosion this range has been broken into individual blocks. The Quarternary glaciation has contributed to widening and reforming the valleys. Most heavily cut up is the steep southern slope. The gol'tsy resting on the surface of the massif attain an absolute height of approximately 2,000 meters.

The Udokan Mountain Range in its picture shows a far greater unevenness than the Kodar Mountain Range. The former clod is broken up into irregular parts, which lie at various heights. Here, too, erosion has participated very strongly in the destruction of the original forms. Most strongly torn up is the decline toward the east to the valley of the Olekma. The highest places in the mountain ranges, especially in the area where the Udokan runs into the Kalar Mountain Range, received their present-day face through the Quarternary glaciation, whose traces are visible everywhere and give this part of the mountain range an Alpine appearance. But, in addition, there are also level high plains in the Udokan Mountain Range. In these high plains the original form of the post-Tertiary peneplain is visible.

Aside from the parts where it unites with /236/ the Ukokan Mountain Range, the Kalar Mountain Range generally has more high plains and flat gol'tsy, whose slopes are saturated with pieces of rock and boulders. The Kalar has preserved its plateau-like character better than the Udokan Mountain Range. Toward the south the Kalar slopes slowly to the middle and lower course of the Kalar valley.

The greatest part of the Olekma Highland is overgrown with [137] thick taiga; only the high gol'tsy project beyond these forests and are covered with bent wood or tundra vegetation. The highest mountains are without any form of plant growth. The swampiness is generally very great. It occurs most heavily in the level high plains and the valley depressions. The valley of the Chara especially is very heavily covered with swamps, just as generally the valleys opening toward the north suffer more from much too much dampness than the valleys opening toward the south. However, already here lonely Russian [311] settlements are found, in which agriculture is pursued. Tungus reindeer breeders are known in the valleys of the Kalakan and Kalar.

133 Gold streams are mined on the Ketemakhta, a left tributary of the
[316] upper Kalar. Connection with the outside world is provided by
[487] mountain paths, which lead toward the south to the Mogocha Station
on the Amur Railroad.

The Olekminsk Stanovik comprises the entire area around the upper course of the Olekma and at the same time forms the watershed for the Amur. The entire region is described as a forest-covered plateau, whose general height lies between 950 and 1,000 meters. The river valleys are mostly deeply etched, and lie 80 to 200 meters below the surface of the plateau. The ridge between the Olekma and its right tributary the Tungir bears the name of Dzhaliro-Tungirskiy Mountain Range; otherwise individual designations are not known. The watershed for the Amur forms a flat ridge, which generally is only 800 to 900 meters high. Toward the south, toward the Amur, this ridge gives way very quickly to hilly country, which is interrupted by the broad valley areas of the numerous waters flowing into the Amur. The most important of these is the Amazar, whose valley
[237] is also used for a stretch by the Amur Railroad. In contrast to the
thick larch forests, which cover the bulk of the Stanovik, the vegetation
on the slopes inclined toward the Amur includes numerous deciduous
trees and thus shows already a more friendly picture. Gold is the
316 most valuable product of the regions. The river valleys between the upper Tungir and the Amazar are especially rich in gold. These valleys are very well opened up because of their nearness to the railroad. The center of gold mining is the city of Mogocha, which has approximately 30,000 inhabitants. It lies on the railroad on the left side of the Amazar. The alluvial sands of the little rivers flowing into the Amur also have gold and, therefore, from early times have
[361] enticed many men who then remained in the land. Accordingly, the
entire strip of land between the railroad and the Amur is relatively thickly settled. Worthy of mention here is the valley of the Urusha, which is crossed /237/ by the railroad at the station of the same name. In the vicinity of Urusha brown coal deposits have been determined, and, west of Urusha in the vicinity of the Yerofei Pavlovich station (which has more than 20,000 inhabitants), there are also usable tin deposits.

The Oldoy-Zeya Mountain Country

133 East of the area around the upper course of the Olekma, the

Amur country begins with the Oldoy-Zeya Highland. This highland comprises the drainage area of the Oldoy and of the upper and middle Zeya and extends from the Amur into the region of Uda Bay on the Sea of Okhotsk. Turning first toward the north and then toward the east, this region comprises the areas on the lower Zeya and Bureya, i.e., the interior Amur regions, which lie lower and which are for the most part flat.

In the west the region is bordered by the watershed between the Amur and the Olekma, and the Oldoy and Nyukzha; and on the north the region is bordered by the watershed to the Aldan, which runs along on the Stanovoy. The eastern border is formed by the watershed for the Uda and the upper and middle Bureya. The area around the source of the Selemdzha with its mountain chains and the Turana ridge with the Bureya Mountain Range will be discussed later. In contrast to Transbaykal with its rich alternation of narrow mountain chains and valley depressions, here we deal with large relief forms, namely with two long, wide mountain ridges and an almost equally wide depression lying between them. However, the horst form and the plateau-shaped surface of the ridge remain predominant as Baykal characteristics. Thus the region is divided into the mighty, massive Stanovoy in the north, at whose southern foot there clings the extended depression of the upper Zeya; this depression is, then, closed off by a long mountain chain running in a parallel strip. This long mountain chain consists of three parts following one another from west to east: the Yankan, Tukuringra, and Dzhagday. In addition, there is the fourth individual section, the Oldoy Highland in the west between the Yankan and the Amur.

The Stanovoy is generally still very little explored. It is, however, certain today that the former conception of a watershed mountain chain does not correspond to reality, but rather that the Stanovoy represents much more an entire mountain range system, which extend in a continuing width of 100 kilometers or more from the Olekma almost to the coast of the Sea of Okhotsk. According to Tanfiliev (207), the Stanovoy system is divided into three relief zones running parallel to one another. Forming the northern edge and lying between soft

207. Tanfiliev, G.I. Geografiia Rossii: Relief Aziatskoi Rossii /Geography of Russia: The Relief of Asiatic Russia/. 2 vols. Odessa, 1923.

forms is a train of numerous, sharply set off groups and series of gol'tsy, which for the most part consist of eruptive stone and then project in especially strongly profiled mountain forms. The middle zone constitutes a plateau-shaped, /238/ /Sketch Showing the Morphological Profile of the Stanovoy Ridge from Bomnak on the Zeya to Great Toko Lake in the area around the source of the Aldan tributary, the Uchur, according to N.I. Prokhorov./ elevated ridge and is very broadly built up. Groups of mountains occur extremely rarely here. The character of a mountain range is often lost entirely, especially in the eastern half, and for the traveler there arises the impression of a vast, rolling plain; this impression is strengthened by the great swampiness and the numerous lakes imbedded there. On this high plain most of the rivers have their beginning, both those rivers flowing toward the north to the Aldan (Lena system) and also those flowing toward the south to the Zeya. The watershed is, therefore, not clearly determined by the relief, but rather it is very jagged. Therefore, many rivers also flow locally in a broad circle along the plateau, such as the Tok River, which follows this direction for more than 50 kilometers before it turns toward the south to the Zeya. The plateau-shaped ridge generally lies at an absolute height of approximately 1,000 meters; the highest places reach 1,300 to 1,450 meters. The northern border zone projects somewhat beyond the high plain, which, however, in the eastern part, north of the source rivers of the Zeya, has more considerable heights. The highest point here is measured at 2,482 meters. The southern border of the plateau again forms a more marked mountain landscape, but here there are only flat groups of gol'tsy without the character of a mountain range, and this section is not built up equally everywhere. As a rule the southern slope is formed by individual plateau sections, flatly inclined toward the south. Between these plateau sections lie valleys, which quickly become wider and which without a break go directly into the depression of the upper Zeya. As Ahnert (17) who crossed the

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17. Ahnert, E. von. Zwei Überquerungen der Stanowoj-Wasserscheide /Two Crossings of the Stanovoy Watershed/ (Russian). Geologische Forschungen in den Goldgebieten des Amur-und Küstengebiets /Geological Research in the Gold Regions of the Amur and the Maritime Regions/, Vol. VIII. Petersburg, 1908.

3: Thiel--272K-4,5 (no date) 1953 RR1 Siberia RR1

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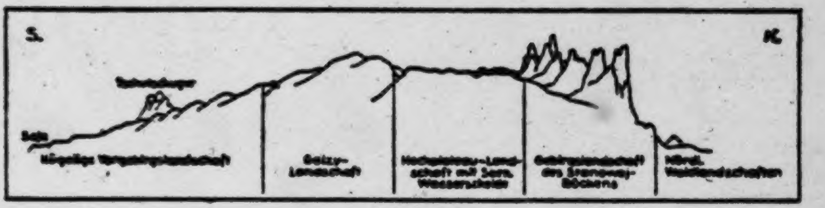
S.
N.
Tschutschugur
Seja
Hügelige Vorgebirgslandschaft
Golzy-Landschaft
Hochplateau-Landschaft mit Seen, Wasserscheide
Gebirgslandschaft des Stanowoj-Rückens
Nördl. Waldlandschaften

Sketch Showing the Morphological Profile of the Stanovoy Ridge from Bomnak on the Zeya to Great Toko Lake in the area around the source of the Aldan tributary, the Uchur, according to N.I. Prokhorov. The sections of the profile are as follows: Zeya, headland landscape, Chuchugur; gol'tsy landscape; high plateau landscape with lakes, watershed; mountain range landscape of the Stanovoy Ridge; northern forest landscapes.

Stanovoy in two places, reports, it is characteristic of the entire
structure of the Stanovoy that the plateau in the middle slopes both
toward the north and also toward the south in step-shaped breaks,
which stretch in a latitudinal direction. Also in terms of landscape
there is a difference between the two outer zones. In the north the
valleys are mostly filled with forest, and only the deepest places are
taken up by moss hills and moss swamps, while the heights appear
bare of forest and are covered with rock ruins and boulders or consist
of smooth, steeply towering, contiguous bare rock. In the south, on [137]
the other hand, /239/ all the heights have thick forests, and only the
valley areas are without forest, as a consequence of the greater
swampiness. In contrast to the rest of the Stanovoy, the area around
the source of the Zeya is also mountainous in the south.

South of the Stanovoy stretches the upper Zeya's broad graben
depression which is filled with forests and swamps. Opposite it and
coming from the west is the valley of the Gilyuy which is significantly
narrower. Both are among the richest gold fields in the Far Eastern [316]
regions and are, therefore, better known. The valley floors and even
the gentle plateau slopes are mostly covered with a thick layer of moss [137]
drenched with dampness, while thick larch taiga grows on the better-drained slopes and elevated places. Deciduous trees occur here only
very rarely. As a consequence of the predominant permanently frozen
earth, there are often moss hills containing ice cores. These hills
are often several meters high, and, if they appear in large numbers,
they give rise to a landscape similar to a hill tundra. The crossing
of such moss swamps is made difficult by the fact that the frozen earth
has gaps, probably because of warm springs, and, accordingly in such
places one can sink to unfathomable depths. Where gold mining is
pursued, the taiga as a rule is destroyed beforehand by forest fires set
off intentionally. The taiga thus gives way to a horrible, plundered
landscape, in which there are numerous, deserted huts, which, over-grown with bushes, are falling into ruin and increase still more the
despair of the picture. The region does not have larger localities. [361]
There are some villages, such as Potekhino and Bryatan in the center
of the depression, in which there are larger supply warehouses from
which the widely scattered settlements of gold washers are supplied.
The extraction of gold, now run by the state, brings rich yields and [316]
has made the depression into one of the most important gold areas in
the Far East. The gold streams lie along the Zeya and the Gilyuy and
their tributaries. The very great swampiness and the existence of

133 permafrost, however, create great difficulties. Development of the
area is hampered by the area's remoteness and the difficulty of gaining
access to it, since the break-through valley of the Zeya toward the
[505] south represents the sole gateway to the depression. To date the
supplying of the area has been done on the water route as far as the
locality of Zeya, for the Zeya River is navigable to this point. The
[491] supplies are then brought by vehicles further up the river. The area
around the upper course of the Gilyuy is crossed by the highway from
Never to Yakutsk. This highway crosses the Tyndinsk, a tributary of
[496] the Gilyuy, at Tyndinsk. The new Baykal-Amur Railroad, coming
from the Nyukzha valley, is also supposed to enter the valley of the
Gilyuy at the same place and to follow the Gilyuy as far as the Zeya,
in order then likewise to use the Zeya's break-through valley as an
exit toward the south. The laying of this railroad line through the
Zeya-Gilyuy depression is expected to lead not only to better opportunities
for exploiting the gold fields but also to the use of the rich supplies
of wood in the forests, and finally also to better settlement of the
area.

/240/ The depression of the upper Zeya and Gilyuy is cut off into a vast basin on the south by a watershed mountain chain. The Zeya is the sole river flowing off to the south in this basin. This mountain chain is regarded as a continuation of the Daur and the Shilka mountain ranges; it stretches from Transbaykal via the Olekminsk Stanovik to the depressions of the Amgun (left tributary of the lower Amur) (207). This entire line of mountain ranges was, according to Ahnert (16), formed partly by faulting but principally and especially on the southern edge, by break formations. Within the Oldoy-Zeya Highland the chain of mountain ranges begins in the west with the Yankan Mountain Range, which lies between the upper courses of the

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207. Tanfiliev, G.I., Geografiia Rossii: Relief Aziatskoi Rossii /Geography of Russia: The Relief of Asiatic Russia/, 2 vols., (Odessa, 1923), p. 250.

16. Anert /sic/, E.E. Kratkii geologicheskii ocherk Priamuria /Short Geological Sketch of the Amur Region/. Geological Research in the Gold Regions of Siberia, Vol. XVII. Petersburg, 1913.

Oldoy and of the Great Urkan. Without a prominent delimitation the Yankan extends out from the Olekminsk Stanovik toward the east and also shows a gradual transition through the dissolution of the plateau-shaped surface, both toward the north to the area around the upper course of the Gilyuy and also toward the south to the Amur. The Tukuringra Mountain Range stands out far more sharply in its isolation, since it forms the demarcation line between two marked depressions, i.e., between the already mentioned depression on the upper Zeya and the Gilyuy in the north and the wide Zeya-Bureya plain in the south, which here projects toward the north as far as the foot of the mountain range. The Tukuringra Mountain Range consists principally of metamorphic rock and in part of gneiss and crystalline slate. It is heavily cut up by extensive erosion and divided into individual massifs, which in part also go back to vertical dislocations. The surface is characterized by the usual plateau form with peaks and gol'tsy set on it. The gol'tsy often stand close to one another and not uncommonly form a middle mountain range landscape with significant differences in height. The general height of the plateau area is 900 to 1,000 meters, while the peaks project 500 to 600 meters beyond this. A great part of the mountain range is covered with thick taiga, and [137] only the highest gol'tsy are without forests. Accompanying the Siberian types of trees are numerous deciduous trees on the southern slopes. These deciduous trees give a more friendly stamp to the picture of the landscape. However, along with the moderation of the climatic conditions, an extraordinarily thick underwood sets in at the same time. This underwood is very much of a hindrance to man's advance, and, accordingly, despite the lighter colors, the landscape's animosity to cultivation remains here too--a quality which especially distinguishes all these mountainous regions.

From the Dep River, a left tributary of the middle Zeya, the continuation of the chain of mountain ranges toward the east bears the name of Dzhagdy Mountain Range. A cross-connection from it toward the north to the Stanovoy forms the eastern cut-off of the upper Zeya depression and at the same time the watershed between the Zeya and the Uda. This remote mountain barrier is as good as not explored at all. In its central part it is supposed to be 2,000 meters and more high. The Dzhagdy Mountain Range itself continues generally toward the east with a change several times in its direction. /241/ It divides the drainage area of the Uda from the Selemdzha, the largest left tributary of the Zeya, and then goes over into the Bureya Highland, whose

133 northern edge it represents.

The Oldoy Highland is the smallest part of the region as a whole, and it comprises the area between the Yankan Mountain Range and the Amur. Already from the region around the source of the Oldoy toward the south the landscape flattens out and dissolves into individual ridges, mountains, and valley areas, giving the overall impression of a mountainous and hilly landscape. Toward the southeast, between the Urkan and the Amur, the broad hill ridges gradually disappear altogether, and the landscape here flows into the so-called Amur-Zeya plateau, which already belongs to the greater landscape of the Zeya-Bureya plain area.

491 The Oldoy Highland is traversed in the north by the Amur
496 Railroad, from which a railroad line to the Amur harbor of Dzhalinda branches off in Skovorodino (more than 20,000 inhabitants), the seat of a railroad office. Thus, in terms of transportation, this region is quite well opened up. This is also true of the most heavily populated parts within the overall region. The alluvial sands of the rivers to the north of the Amur Railroad, especially the valleys of the upper Oldoy, and of the Great and Lesser Urkan, are rich in gold. The built-up highway which is mentioned above and which can be used throughout the year, leads from the station of Never (around 10,000 inhabitants). This highway crosses the Tukuringra Mountain Range and the Stanovoy in its western part and goes via the Aldan gold fields to Yakutsk. It reaches Tyndinsk in the area around the upper course of the Gilyuy. This important highway has recently been supplemented by a railroad line from Skovorodino to Tyndinsk, where there is a spur to the great Baykal-Amur Railroad (BAM). With this a direct cross-connection between the Amur shipping and the BAM is supposed to be created. The new railroad line, in addition, opens up new areas for settlement, just as the construction of the Amur Railroad has become a pacemaker for heavier settlement by an agricultural population. Also in the less swampy valley areas between the railroad and the Amur River agriculture is
361 pursued relatively actively. Accordingly, a lively food industry and also machine building shops and repair shops have been able to develop in Skovorodino, which has already been named as the center of the Oldoy Highland. Brown coal, which is mined in the vicinity, is used as the raw material for energy. To the north of the city tin supplies
[509] have been determined. An airfield in the vicinity connects Skovorodino to the great airline running from Moscow to Khabarovsk to Vladivostok.

The Zeya-Bureya Plain

This area is the section of the Amur country which is the richest /33 in population and which is the best opened up economically. The easily accessible plain, the milder climate, the fertile soil have from early times /242/ caused a relatively heavy population to settle here, and pursue agriculture. This plain is the granary of the Amur region; 80 [311] percent of the total area under cultivation in the region lies here.

The region falls into two sections: the Amur-Zeya plateau in the west and the great Zeya-Bureya lowland, which extends east of the lower course of the Zeya along the Amur as far as the Bureya Mountain Range.

The Amur-Zeya plateau takes up the western part. This plateau stretches between the Zeya, its tributary the Urkan, and the Amur. The plateau declines slowly from the northwest to the southeast; the interior sections are gently rolling open country; on the other hand, the rivers toward the outside have dug deep gorges. The plateau breaks off sharply toward the lower Zeya and toward the Amur. On the right bank of the lower Zeya the decline becomes 180 to 240 meters deep and, with its heavy gorge formations, gives the impression of a mountain when viewed from the eastern "meadow shore." On the Amur the plateau lies 100 to 120 meters above the river at most, but only very rarely does the plateau come near the river. Here between Chernyayevo and Blagoveshchensk, the Amur valley has four terraces. The lowest one is exposed only when the water is low. Adjoining it with a step up of 4 to 6 meters, and, in places even 8 meters, is the meadow terrace with sandy, gravelly, and muddy deposits. This terrace is considerably wider and is regularly flooded when the water is high. The next middle terrace lies 10 to 20 meters above the normal water level and also breaks off precipitously toward the second terrace mentioned above. Forming a steep bank, this terrace also goes right to the path of the water in many places. There are already settlements in many places on it. The fourth or upper terrace attains a height of 50 to 60 meters and is less clearly set off. The northwestern [137] part of the plateau still has a thick forest covering, but here the percentage of deciduous trees is very considerable. Toward the southeast the thickness of the forests decreases, and they gradually give way to a type of forest steppe. Characteristic of this section are little birch forests and extensive swamps and swamp meadows. Accordingly, livestock breeding predominates among the Russians settled here.

361 Only in the southeast in the triangle between the Amur and the lower Zeya is there an agricultural settlement covering an area of any size. In the rest of this region a zone of settlements with many gaps accompanies the Amur and the railroad.

496 The Amur Railroad runs approximately along the middle of the plateau and uses the watershed exactly, since along the watershed there was, for understandable reasons, the best and the easiest opportunity for marking off. A branch railroad, 38 kilometers long, leads from Ushumun station to Chernyayevo on the Amur, in the center of a
135 region with great prospects for the future, for here only a few years ago hard coal deposits were determined. These deposits stretch along the left side of the Amur between its tributaries, the Urinda and Magdagachi, i.e., approximately around the locality of Chernyayevo mentioned above. The coal is of Jurassic age and lies in individual anticlines, which stretch toward the northeast. Although, judging from individual tests, the ash content of the coal is supposed to be great, the deposits have a prominent significance because they lie in a region /243/ /Sketch Map of the Amur Oblast:/ which formerly had to be supplied with coal from a great distance. In some places the coal-bearing layers are broken through by granite laccolite and porphyry effusions, and thus the coal here has been transformed into valuable semi-anthracite and full anthracite. Nothing is known of the total supply in the deposit designated by the Russians as the "Upper Amur Coal Basin," There are numerous outcroppings on the Amur and in the individual river valleys. Very recently the mining of the coal deposits in the vicinity of Madgagachi has begun.

361 The principal locality in the northwestern part of the plateau is Magdagachi (approximately 10,000 inhabitants); the principal locality in the southeastern part is Shumanovskaya (approximately 25,000 inhabitants). Both of these towns lie on the Amur Railroad.
[487] The Tygda station between Madgadachi and Ushumun has greater significance in terms of transportation. A land route leads from Tygda via Ovsyanka, which lies at the point where the Zeya and the Urkan flow together, to the Tukuringra break-through of the Zeya. This is the shortest land route connection from the Amur Railroad to the gold fields on the upper Zeya and the Gilyuy.

133 /244/ East of the lower Zeya begins the Zeya-Bureya Lowland, which stretches toward the east along the Amur over a broad area extending beyond the lower course of the Bureya. The end of this low plain is prepared by the high embankment of the Bureya Mountain

Range, which here goes up to the Amur. Toward the north the plain 133
extends into the river area of the Selemdzha as far as the spurs of the Tukuringra Mountain Range. Vast plains, formed by Tertiary fresh water deposits, warm, damp summers, extensive agriculture, a heavy population, numerous villages and little cities--all these are the main distinguishing marks of this region.

The southern part along the lower courses of the rivers is almost completely level and is often covered with old waters, swamps, and lakes. But even here dry islands rise in long, flat waves in the areas between the rivers. Morphologically, however, these dry islands are scarcely striking in the plains which generally predominate. Instead, something of a change in the vast monotony is brought by the paths of the rivers, all of which have a marked steep right bank which though not high, is still heavily gorged. The left meadow shore, which mostly is covered with swamps, then rises gradually to the watershed areas. The Bureya continues to show this asymmetrical shore formation even far into the mountain country. North of the Tom', a left tributary of the Zeya, the relief changes. It becomes rolling,
hilly, and rises gradually toward the north. Here ends the contiguous 133
meadow steppe, which in its natural state has grasses as tall as a man 137
growing on it. These grasses have brought the steppe the name of "Amur Prairie." This meadow steppe makes way for a magnificent, peculiar forest steppe, in which the hills and high places are covered like islands with oak forests or bushes, while the meadow steppe continues in the lower spots. The dampness of the soil decreases, even though in spots there are often swampy places in the loamy soil. With the further rise toward the north the differences in height become greater, the valley areas become deeper and narrower. Coniferous trees appear on the mountains. The swampiness of the valleys begins to increase again. Slowly the dark taiga takes possession of the entire land, while in the background the rocky peaks of individual gol'tsy already rise from the contiguous greenery.

The significance of the Zeya-Bureya plain is based on the 134
extraordinary fertility of its soil. Tomashevskii (219) has investigated

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219. Tomashevskii, I.I. Pochvy iugozapadnoi chasti Zeiskobureinskogo vodorazdela /The Soil of the Southwestern Part of the Zeya-Bureya Watershed/. Works of the Amur Expedition, Vol. XV. Petersburg, 1912.

Region/. Pochvovedniie, 1911.

/133 The northern part of the Zeya-Bureya plain lies generally below 500 meters above sea level and declines toward the lower Zeya and the Amur, /247/ /Sketch Map:/ /248/ where the greatest part lies at less than 200 meters above sea level. At Blagoveshchensk the Amur has a height of 120 meters. In individual places the substratum comes out from the flatly deposited Tertiary layers in the form of individual rocks, which consist of granite, Jurassic conglomerates and Jurassic sandstone, or also of porphyry.

The great dampness of the Zeya-Bureya plain, which arises from the excessive summer rainfall, leads in the unlevel regions to hanging landslips and solifluction phenomena of manifold types, which cause great difficulties in the construction of roads and installation of railroads, especially when--as, for example, in the country of mountain spurs--permafrost appears. The peasant fights constantly
[311] against threatening swampiness by draining his land. Despite these difficulties, the area under cultivation is increasing continually. The swamps, which as a rule are covered with clusters of grass, are turned into hay fields by fires set off every year, and these hay fields in turn are then turned into cultivated land.

361 Settlement is very thick, and in the valley area of the Zeya, Selemdzha, and Bureya it penetrates farther and farther into the interior. In the plains one can often see from one village to the next one. The settlements differ in no respect from those in the Russian homeland. And when in mid-summer sunflower fields glow between the yellow gold of wheat fields, one might feel himself transported
[214] to southern Russia. The cultivation of soy beans and perilla, which here lays claim to a significant percentage of the area under cultivation,
[496] appears foreign, however. The railroad crosses the Zeya at Svobodnyy (10,000 inhabitants), where an active wood industry has developed. A branch railroad, which is 108 kilometers long, leads from Kuybyshevska with its more than 10,000 inhabitants to Blagoveshchensk (58,700 inhabitants), the capital of the region. The city extends along the shore of the Amur for a distance of almost 8 kilometers, toward the mouth of the Zeya. The Zeya here is 2 kilometers wide and exceeds even the Amur into which it flows. The city is the center of the entire agricultural area and has numerous flour and oil mills. In addition, the processing of lumber also plays a large role. The lumber is floated here on the Zeya and the Amur. Opposite Blagoveshchensk,

on the Manchurian side, lies the city of Heino (Sakhalyan), from 361 whence there is a spur to the railroad network of Manchuria. The area around the lower course of the Bureya has the same character in terms of landscape as do the plains on the Zeya. The nearness of the highland permits the basic rock to come out more often here. The population is likewise dense and in the valley of the Bureya penetrates farther toward the north into the highland. The center of the region is the little city of Bureya, which lies at the point where the railroad crosses the Bureya River. A railroad line, which is 43 kilometers long, branches off from here to Raychikhinsk, the center of the largest brown coal deposit [496] in the Amur country. Zavitaya, from which a new railroad line has been built to Poyarkovo on the Amur, /249/ has acquired a growing importance during the most recent period.

The brown coal fields lie between the railroad and the Amur 316 and stretch from the Bureya in the east to the Zavitaya in the west, covering an area of 600 square kilometers. Raychikhinsk and Kivdinskiy are the centers of the coal mining. The transporting of the coal is done for the most part by railroad to the Bureya station, where there are opportunities to transfer the goods to river shipping.

The northern part of the Zeya-Bureya plain is drained primarily 361 by the Selemdzha. The population here decreases rapidly toward the north, and settlement is limited to the valley areas of the rivers. On the Zeya, settlement reaches to the town of the same name at the foot of the Tukuringra Mountain Range; and on the Selemdzha, settlement ends approximately at Norsk. Both rivers are regularly traveled [505] by steamships as far as the localities named. With the new construction of the BAM, which goes from the middle Zeya and runs through the area toward the east and crosses over the Selemdzha at the locality of Norsk mentioned above, new prospects have opened up for the further development of these regions, which are favorable for settlement but which in the past were too remote.

The Bureya Mountain Country

The Bureya Highland has a central position in the Amur country. 133 It forces the Amur to make its large southern bend; and, in the south where it joins the Little Khingan, it makes a path to the east free for the Amur only in a narrow break-through valley. In the same place the Bureya Highland shoves itself like a wedge into the great depressions running along the Amur and separates the Zeya-Bureya plain in the

133 west from the depressions on the lower Amur and Amgun.

For the most part the highland comprises, as its inner zone, the drainage area of the Bureya, which also is bordered by the two main chains of the highland: i.e., in the west by the Turana Ridge, which is the watershed toward the Zeya, and in the east by the Bureya Mountain Range, which represents the watershed toward the lower Amur.

The Bureya Mountain Range forms the backbone of the highland. It begins on the Amur as the continuation of the Little Khingan which stretches from Manchuria over the river toward the northeast. The Bureya Range is, therefore, also known under the name of Little Khingan. But here the Russian geographers, who designated the mountain chain generally as the Bureya Mountain Range, are to be followed. These mountains run principally toward the northeast, though the direction of individual sections changes from place to place. This continues until the mountain range runs into the already mentioned Dzhagdy Mountain Range, which comes from the west. Here in the north individual sections are known under special names: thus, the Duse-Alin', which in an arc surrounds the left source river of the Bureya (Levaya Bureya), and, adjoining the Duse-Alin' on the north, the Yam-Alin', which flows into the Dzhagdy Mountain Range. The Tam-Alin' and the Dzhagdy border on the north and the east the gold-rich area /250/ around the source and the upper course of the Selemdzha; while from the southern part of the Yam-Alin' a mighty massif, forming a watershed, shoves in toward the west between the Selemdzha and the upper Bureya. Here in the northern part of the Bureya Highland, where immense high plateaus unite in a narrow area, there also lie the highest elevations of the Bureya Mountain Range and also the highest elevations of the entire highland. The Yam-Alin' has several peaks which project 2,000 meters. Its highest point reaches 2,215 meters. Also the watershed massif between the sources of the Selemdzha and the Bureya has several gol'tsy, which are only a little inferior to the Yam-Alin' peaks and which project between 2,115 meters and 2,155 meters.

316 The area around the source of the Selemdzha is rich in gold and has gold-washing installations, which are in part mechanically run. But the remoteness of the region causes the very great difficulties
505 to the works which are directed by the state. The primary supply route is the Selemdzha, which is regularly traveled by steamers as far as Norsk, often designated as Norskiy-Sklad. And under favorable Conditions the Selemdzha is even traveled as far as Selemdzhinsk.

conditions the Selemdzha is even traveled as far as Selemdzhinsk. But then begins a land route which is 250 kilometers long and is laborious to travel. At the end this land route reaches the high-lying gold fields with steep ascents. 000 487

From the mighty complex of the high plateaus, which surround the area around the source of the Selemdzha, the highland gradually declines toward the south. The surface of the Bureya Mountain Range is only 600 meters high on the upper course of the Amgun and of the Tunguska (a left tributary of the Amur), and only individual gol'tsy rise to heights of 1,000 meters. The Amur Railroad crosses the mountain range in the Lagaraul Pass at a height of 452 meters, and on the Amur itself the highest mountains only reach a height of 200 meters. The mountains here come in a broad front directly to the river, which breaks through the Khingan-Bureya Mountain Range here between Pashkovo and Yekaterino-Nikolskoye in a narrow valley which is 150 kilometers long. The great masses of water are pressed together here by steeply declining, often bare rocks, which come together in places to form a narrow corridor with high, almost perpendicular walls. /33

The general impression of the Bureya Mountain Range differs little from that of the Zeya Highland. Here, too, the basic forms permit the plateau-shaped surface to be recognized, and projecting from this plateau surface are numerous gol'tsy. However, all parts of the mountain range here show greater effects of erosion, which undoubtedly goes back to the heavier rainfall. Almost all the rivers, at least in their upper courses, flow in narrow, rocky, deeply etched gorges as long as they remain in the sphere of the plateau-shaped elevations. Then the valley areas quickly widen, and, even though they are often still accompanied by steep, rocky slopes, the valleys extend between the gently inclined slopes of the swampy plateau. But also in the lower places there are still individual cones or summits sitting on the plateau.

The vegetation of the Bureya Highland is /251/ unusually varied. The reason for this lies not only in the changing relief but also primarily in the fact that the elements of three flora regions meet here, namely the East Siberian, Okhotsk, and Manchurian flora regions. In the northern parts of the highland on the mountains and slopes at a height of 600 to 900 meters there are thick forests which consist primarily of Ayan spruce (Picea ajanensis) and fir with white bark (Abies nephrolepsis), with a small number of birches intermixed. The low temperatures, the cool fog, and the strong, damp winds which blow /37

Mountain Range to the upper course of the Tyrma and then follows this river to the point where it empties into the Bureya. The railroad had already been completed as far as Ust'-Tyrma in 1942. Since then the construction of this railroad, which now runs parallel to the course of the Bureya, has been continued via Chekunda to Umal'ta. With this an outlet has been created for Bureya coal toward the south to the Amur Railroad, but the waterway of the Bureya is also used to transport the coal away. The expansion of this waterway is being worked on. In addition, there is the fact that the Baykal-Amur Railroad also crosses the same region. This railroad leaves the Selemdzha at Norsk, crosses the Turana Ridge and reaches the middle course of the Bureya at Chekunda, to continue further over the Bureya Mountain Range to Komsomol'sk. 496 [505]

The construction of both these railroads in the sphere of the Bureya Mountain Range has above all an industrial significance. Next to coal, wood is the most important item for transport which this region can supply. In the traffic going the other way, the bringing in of food is probably the main task of the railroads. The Bureya also plays a certain role in this connection; for, according to various reports, continuous loads of grain go up the river during the period when it is navigable. The supplying of the new Bureya coal region must be assured from outside because the Bureya valley itself is very unfavorable for agricultural settlement. Everywhere here the Bureya has the character of a mountain river. Its valley between Ust'-Umal'ta and Ust'-Niman is up to 3 kilometers wide, but the river, which here is very wild, regularly floods a part of this country and causes extensive swampiness. From Ust'-Niman to Chekunda the right bank is steep and rocky; the left bank is, to be sure, level, but it is taken up by swamps which are difficult to travel. Below Chekunda as far as the settlement of Paykan the valley narrows, and on both sides the rocky mountains come right down to the shore. Only shortly before leaving the mountain ranges does the valley meadow widen into an area favorable for settlement. Thus the prospects for agrarian settlement in the area of the Bureya valley are not very good, and it will require long years of difficult cultivation work before the new coal mining region will be able to supply its own food. 438 133

If we survey the entire Bureya Highland, then, it can be determined that, apart from the spottily occupied gold regions in the north and apart from the Bureya and Tyrma valleys which are now filling up with people in a limited area, the other regions are as good as 361

361 uninhabited except for in the southern part. Heavier settlement in terms of area covered can be found only in the southern part of the highland, where a contiguous belt of settlements meets us both along the Amur River. While the belt of settlements along the Amur River is certainly purely agricultural, industrial activity is to be encountered along the railroad in the area of the Bureya Mountain Range. In Bira 316 hard coal is mined /253/, iron ore lies west of Bira in Kimkan, and farther on in the vicinity of the railroad there are known to be supplies of magnesite, manganese, and fluorspar. Gold is also there and is extracted from the gold streams of the Sutar valley. This sourthern part of the Bureya Highland belongs to the Jewish Autonomous Oblast. It will be discussed in context in the following chapter.

/Sketch Map of the Jewish Autonomous Oblast/

The Amur Plain

•133 This region extends from the eastern slopes of the Bureya Mountain Range to the shore of the lower Amur, and it forms a vast lowland covered with meadow steppe. This lowland is scarely inferior to the Zeya-Bureya plain in the luxuriant growth of grass. The mean height of the plain is 45 meters. On the eastern side of the Bureya Mountain Range there run parallel to this range some mountain ridges, which go beyond the 1,000 meter mark only in the rarest of cases, such as in the Badzhal'skiy Mountain Range.

The Amur plain is regarded as a continuation of the Ussuri-Khanka depression and represents a graben zone, which is set between the Bureya Mountain Range on the west and the Sikhote-Alin' on the east.

The plain itself is divided into the flood area, which can be from a few kilometers up to 20 kilometers wide, and the real plain, which begins with a step. Only the edge of the plain is cut up by the rivers; otherwise the plain is for the most part completely flat and toward the mountains goes gradually over into a hilly landscape. The country on the right bank of the Amur below the mouth of the Ussuri is more varied in form /254/ because of the spurs of the Sikhote-Alin'. This area is generally higher, and its landscape is gently rolling to hilly.

Even though the external picture of this area recalls that of the Zeya-Bureya plain, the Amur plain, nevertheless, differs because of its greater swampiness, which goes back in the first place to the damper

climate and then also to the great masses of water which flow together 133
here in the Amur, Sungari, and Ussuri. With the relatively low position of the plain these great masses of water permit the ground water to rise very high to the water level of the rivers. The swampiness is also fostered by the old sea deposits lying in the ground of the plain. These sea deposits mostly form a solid, impermeable layer of loam. In addition there is a further difference, which lies in the state of development of the landscape. In contrast to the thickly settled, cultivated landscape of the Zeya-Bureya plain, the Amur plain is occupied only in its southern part and here, too, only in strips--along the railroad and along the Amur. The largest part, especially the area below Khabarovsk, is only sporadically occupied by settlements, which here completely disappear in the vast natural landscape.

After the break through in the Bureya Mountain Range, where the Amur is in places compressed to a width of almost 500 meters, the river expands to a true lowland stream. The banks become low and move back, numerous islands, often of great length, occur and divide the river into very many arms. Normal widths of 2 to 5 kilometers are no longer a rarity. The Sungari, which the Amur takes in here from the right, comes far from the south of Manchuria and brings warmer water to the Amur; accordingly, the Amur below the mouth of the Sungari becomes free of ice earlier and also remains open longer. Forty-five kilometers above Khabarovsk and the real mouth of the Amur, the Amur receives the Kasakevichevsk River, the first arm of the Ussuri coming from the south.

The Khabarovsk plain spreads out opposite the mouth of the Sungari and the Ussuri. Thick layers of loam form the base here and, through their impermeability, cause the area's great inclination toward swampiness. As a consequence of this, the areas near the rivers are the least suitable for agriculture, which occurs first on the somewhat higher, better-drained land. In contrast to the Zeya-Bureya plain, therefore, vast areas here remain swampy meadow steppes in their natural state and are used as meadows or hay fields. However, dry ridges and mountain groups also appear in the middle of the Khabarovsk plain. These ridges and mountain groups consists of Paleozoic layers (carbon) and are covered with forests. Their absolute height often reaches 500 meters.

The entire area within the arc of the Amur from Pashkovo to the 634
mouth of the Ussuri belong to the Jewish Autonomous Oblast. Northern 131
border runs north of the railroad line. The oblast covers 36,800 square

vegetables and the breeding of dairy livestock predominate.

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Below Khabarovsk the Amur plain continues toward the north. Here the Amur first develops to its full size. At the city the height of the water level fluctuates between 23.97 meters and 40.20 meters (above sea level), and only a little below the city the river in places goes 10 to 20 kilometers beyond its normal borders when the water is high. In great windings, the river flows on, often making curves and loops of 10 kilometers and more where the direct route would take up only a fraction of that. Numerous old waters and arms follow the main stream. The Tunguska is formed by the two rivers, the Kur and Urmi, /256/ and flows into the Amur from the left. Until a short time ago its lower course was an arm of the Amur; the Tunguska, therefore, has the same river valley and, for the greatest part of its course, flows parallel to the Amur. When the water is high, the upper part of the Tunguska is connected directly with the Amur. Further down the elevations emerging there force the Amur into narrower paths. But again and again the Amur uses every imbedded plain to break up into numerous arms and to fill lake-like structures with its water. With the Kizi and Kada lakes the Amur comes within a few kilometers of the sea coast. Here the mouth of the Amur may once have been located, before an elevation of the ground cut off the exit and forced the masses of water to grope their way further toward the north through a mountainous-hilly country until, after taking in the Amugun, the water found its present way out. Kizi Lake, which is united with the Amur by a natural connecting canal, lies only 15 kilometers from the Tatar Strait and is separated from De-Kastri Bay only by low hilly country, whose greatest height is 155 meters. At this spot a canal from Mariinskoye on the Amur to De-Kastri Bay could shorten the path of the Amur to the sea by around 280 kilometers. This passage has been planned several times.

The Amur plain also continues in the same shape toward the north along the lower course of the river. However, the picture here is much more determined by the flowing waters and the imbedded lakes than in the Khabarovsk plain. In the vicinity of the river, however, the monotonous character is interrupted by elevations and depressions, which line the river. The elevations have the appearance of long extended hills and embankments and are often up to 10 kilometers long. They are old shore embankments, which mostly lie 14 to 16 meters above the normal level of the water and which, therefore, are no longer reached by the floods. These elevations are in part overgrown with

133 meadows on the river, otherwise they are covered with spotty clumps of grass. Where this grass is destroyed, the loose sand shows through, and the wind blows this together into dunes. The shores of the rivers are flat and predominantly covered with meadow, over which the 311 high water extends. The old shore embankments are of greatest importance for human settlement; the broader ridges are as a rule plowed up and used for vegetable gardens, while the areas which become flooded serve as meadows or are used as hay fields. Now and again the entire plain is narrowed down by approaching mountains, or the plain widens to a great breadth with the neighboring depressions adjoining it. In such an area, in wide, swampy surroundings, lies the very flat Lake Bolon' which is 1,200 square kilometers and which is connected to the Amur by a broad water stream. The water level of the lake follows that of the Amur, and when the water is high even a backward flow is to be observed. At Komsomol'sk the hilly mountains come right down to the river on both sides and force the river into one continuous bed. Here ends the contiguous line of the real Amur plain with its magnificently flat relief, /257/ and an irregularly formed landscape begins. Nemerous rows of hills and chains of mountains with heights of up to 500 meters, indeed, even up to 900 meters, make the general picture more lively. The Amur again and again gains in area and widens often like a lake with numerous islands in the broad valley areas and forms in its neighborhood standing water in the form of long lakes in individual basins and old river beds. Despite this, the overall character of the far more broken up Amur plain is determined by the tributaries, which flow into the Amur from both sides in long, often curved, wide valley areas and which increase still more the degree of dividing up of the country. First to be mentioned in this connection is the valley of the Gorin, which extends into a broad depression in the hinterland and which conceals there the big 135 Lake Evoron. Further down are the plains of the Limuri and Pilda; the area around the upper course of these rivers is known for its gold sands. 133 Finally there is the extended valley of the Amgun which is more than 137 800 kilometers long. The general landscape picture changes its face but little toward the north. Meadow steppes, overgrown with high grasses, are also still typical here, even though the ground becomes ever damper toward the north and the swampiness increases. The same applies also to the appearance of broad-leaved deciduous trees within the forested areas; these forests represent characteristic mixed forests on the lower hills and mountains. In the direction of the

Bureya Mountain Range the deciduous trees disappear as the height increases, and on the mountain range itself and in the Bureya Highland Siberian taiga with Okhotsk strains penetrates generally far toward the south. In the Amur region itself the moderating influence from the south ends with the closed off plain, the climatic conditions become more unfavorable, cooler, and damper; the Sea of Okhotsk dominates here. The meadow steppes change into treeless moss swamps; coniferous forests of an Okhotsk stamp cover the hills, on which here and there the first appearances of high moor formations can be determined. These are signs, which are typical of the northern coastal mountain landscapes. This region already is reckoned as being such a landscape, and it is for this reason that this area along with the drainage area of the Uda will be treated as an independent region. 133 137

In the Khabarovsk region the Amur plain is settled over a large area. Wheat, barley, and rye are cultivated here still with good harvests, but toward the north potatoes and vegetables take up an increasing percentage of the land cultivated, since the yield of the grain harvests becomes inferior as a consequence of the dampness of the ground. With sufficient drainage, wide areas could still be won here for the cultivation of grain. Instead the excellent natural meadows serve for breeding of livestock. Toward the north the density of the population decreases rapidly, and approximately from the Mukhen, a right tributary, on, settlement is limited to the river banks on which small villages or individual settlements of Russians or natives are to be encountered at a distance of 10 to 20 kilometers from one another. The settlements for the most part lie on the right bank of the Amur, which is the higher bank. The /258/ left side with its unpredictable high waters is too dangerous for man. In favorable spots larger localities have also developed, such as Troitskoye with its approximately 4,000 inhabitants. In general the settlements are small. The Russian villages can be recognized by their wooden houses. The Gilyak, Goldi, and also here and there Chinese and Koreans, on the other hand, in many cases still occupy mud huts, which are built on the pattern of the Chinese fang-tze. Along with the population, agriculture decreases toward the north. Fishing comes more and more into the foreground, until it becomes the principal occupation on the lower Amur. Here again settlements pile up. According to the state organization of the catching of fish, these settlements are specialized for this trade, and they have heavy immigration. Thus the population grows quickly here, but it is dependent on imports for supplies. All the other areas which

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lengthening of the BAM via the Sikhote-Alin' to Sovyetskaya Gavan', 361
which is the best natural harbor on the coast of the Gulf of Tatar. 496
The railroad for a part of the way uses the middle course of the
Khungari, a right tributary of the Amur, in whose basin a large Tertiary
brown coal deposit was discovered in 1932. This deposit is supposed [135]
to be used to run the railroad. At present the railroad to Sovyetskaya [313]
Gavan' already plays an important role in the treating of lumber from
the Sikhote-Alin', which is processed for export in a large lumber
mill in the harbor city.

Nikolayevsk with its approximately 30,000 inhabitants is the 361
economic center in the region around the mouth of the Amur. It owes
its importance above all to the wealth of fish in the neighboring parts
of the sea and in the Amur. Accordingly, it has been able to develop [228]
into one of the largest centers of the fish-processing industry. The [505]
city cannot develop very well as a sea harbor because of the harsh
climatic conditions--the ice-free period lasts only around 160 days--
and the unfavorability of the mouth. The mouth of the river is closed
off by a sand bar of great width, which enables only those ships to
pass which have a draught of up to 3.50 meters. In addition, there
is the fact that the "Amur-Liman" itself is very flat, has many shallows,
and thus permits sea-going ships to travel on it only in a few natural
canals. Thus only smaller coastal vessels can get into the Amur, while
larger sea-going ships must be unloaded on the open sea and their
goods transferred to river vessels. For many years they have been in
the process of creating a suitable waterway in the Amur, but the
difficulties appear to be too great. Above all the natural deposit of
bar sand again and again destroys the work of man.

The Sikhote-Alin'

The Sikhote-Alin' with its mountains fills the entire area from 133●
the mouth of the Amur on the north to the steep break at the Bay of
Peter the Great. In contrast to this vast expanse, the narrow depression
which extends at the western foot of the Sikhote-Alin' and which only
in the south has extensive plains, appears to be of subordinate importance,
particularly, too, because spurs of the Sikhote-Alin' not
uncommonly penetrate almost to the Ussuri, and individual mountains
of the Sikhote-Alin's border steps which traverse the entire land, appear
even in the plain. Nevertheless, the smaller depression has the
greater significance, for in it sits the bulk of the population, and in it

● 133 lie the main fields for producing food in the entire Ussuri country. Thus we can contrast the natural landscape of the Sikhote-Alin', which for the most part is still untouched, with the cultivated landscape of the Ussuri-Khanka depression.

/260/ The Sikhote-Alin' belongs to the more recent peripheral formations of the Asiatic continent and represents the elevated eastern edge of a sunken land step. It lies between the Sea of Japan and the Tatar Strait, on the one side, and the depressions of the Khanka Lake, of the Ussuri, and of the lower Amur, on the other side. The Sikhote-Alin' consists of a series of up to eight parallel mountain ridges which stretch toward the north-northeast. The mean height ranges between 700 and 1, 000 meters. In the northern section individual heights reach up to 1, 300 meters, in the area around the sources of the Bikin and the Iman some mountains project 1, 500 meters, and in the south in the area around the upper course of the Ulukhe the highest elevation to date has been measured as 1, 845 meters. According to a recent publication (Suslov), the highest mountain has been determined now to be the Golets Komarov in the area around the source of the Koppi. This mountain has a height of 1, 940 meters.

The watershed between the Ussuri and the ocean is strongly inclined toward the latter. In this the watershed chains are not always the highest. The area around the source of the Ussuri and also that of its largest tributaries, the Iman and the Bikin, lie not far from the coast. In the central and northern section the conditions are much more complicated. There is no mountain range which is the bearer of the watershed; rather the watershed changes constantly and irregularly from one ridge to another. Often it occurs that rivers which flow into the sea or into the Ussuri-Amur have their origin on the opposite side of a mountain chain, move first in the direction of the long axis of the Sikhote-Alin', then reach the next valley through a breach until--often after several cross passages--they decide on a final exit from the system of the mountain range. Decisive for the peculiar course of the rivers is not only the relief but also the rock. Both are the cause of the broken lines of the courses of the rivers, which are characteristic of all of the Sikhote-Alin'. Accordingly, the rivers also often change their character. Following a quiet course are breaches, gorge-like valleys, waterfalls, river rapids, and then shortly thereafter the river will again flow quietly and calmly for a while. Thus there is generally a very unequal and irregular hydrographical picture.

The entire interior is taken up by contiguous mountain massifs, which extend without interruption as far as the ocean, where they break off at the coast with steep rock steps. The heavy weathering effects of the raw and damp climate and far-reaching powers of erosion of the rivers, which are short but flow down to the coast with great drops and whose erosion basis has changed several times because of vertical movements, have so heavily cut up and changed the ridges near the coast that from the sea these appear to be a high mountain range. The interior itself, however, is monotonous. If one looks out from one of the higher mountains, approximately in the sphere of the watershed chains, the eye encounters a vast series of more or less long chains, stretching predominantly in a north-northeasterly direction. /261/ These chains consist of an almost unending series of accumulations of lower peaks which rarely appear bare and mostly are covered with thick forests. Nowhere is the climatic snow border reached. Where snow lasts until August, indeed, even until September, it occurs in the protection of depressions under the crown roof /Kronendach/ of the taiga. Often, however, the regularity of the mountain chains disappears. Cross-bars connect the individual parts, which stretch toward all four points of the compass. The landscape, however, has a different face where, as in the environs of the Soviet Harbor (Sovyetskaya Gavan') or in the central region on the upper Bikin, basalt and other eruptive elements have poured forth and with their effusions have formed almost level surface forms which often cover many square kilometers. Here the valleys are deeply etched like canyons. The walls decline steeply, often in steps. The high plains break off suddenly, so that, when one is on a high plain, one can for some distance overlook a narrow valley until one unexpectedly stands on the edge, from which the steep wall forms a sharp decline, descending not uncommonly a hundred meters and more. But in the other sections steep projections are also not lacking since the rise to the passes and high plains is mostly very difficult, less so from the west but very difficult from the coast.

Generally striking are the forms of destruction, in which the effects of the monsoon climate are demonstrated. These effects are especially prominent in the south. The effects of the monsoon climate are expressed particularly in the formation of the cone-shaped mountains, which are very numerous in the Sikhote-Alin'. Mostly, however, the mountains are cores such as we find on the Murayev-Amurkiy Peninsula where the cores consist of porphyry and its tuffs and project as individual mountains from the Lower Jurassic sediments. The heavy effects of erosion have been furthered by the rapacious deforestation in the past, which has denuded of forests all sections of the mountain range in the vicinity of the cultivated zone. Also the typhoon-like storms which rage over the southern part of the Sikhote-Alin' every year and often destroy the wood supplies of whole areas, contribute to the fact that the floods of rain can attack the slopes more easily, and thus the dissolution of the forms increases. Worthy of note are the great boulder slopes and stone slopes. Many may well represent prehistorical forms and may stem from earlier climatic periods of a different type from today's, but their formation is also essentially determined by the heavy erosion and the great dampness of the present-day monsoon climate. Often, in the regions around the upper courses of rivers, valleys are to be observed which are torn out as narrow, deep gorges and which have steep slopes which are fully covered with stone heaps. Often a footstep is enough to cause these stone heaps to precipitate down into the valley. Many valleys are notorious for their falling stones and their landslides, and not uncommonly it occurs that narrow gorges are entirely filled up with stones and broken wood. In the regions around the upper courses of the rivers, therefore, the springs and brooks very frequently flow invisibly under rock ruins and come to the surface only after a rather long course in order then to dig themselves a bed.

The forms of the valleys change greatly and show all stages of their development /262/ from narrow gorges to flat valleys which are kilometers wide. Only glacial forms are lacking, for the Sikhote-Alin' was not glaciated. Since the basalt effusions are more recent than many of the old valleys, many of them were dammed up by the basalt streams and then again broken through. Because of the elevation and the retrogressive erosion, sloping valleys and graded river mouths /Stufenmündungen/ are frequent phenomena. The main valleys are disproportionately wide and in their erosion may not keep pace with the recent elevation. Therefore, the lower courses of the rivers as a rule also have sharp drops, often sharper than in the upper courses. Others are extensively heaped up and swampy. This is also a consequence of the very irregular passage of the water, which results from the monsoon climate. The main water veins cannot contain the quantities of water flowing together from hundreds of tributaries during the rainy period, and these main water veins then overflow the entire valley area with great pressure and can become a catastrophe for the people there. All settlements on the lower courses of the rivers coming 133 from the Sikhote-Alin' suffer in such floods. The harsh continental winter brings the appearance of frost such as is usual in Siberia. The water which is pressed out from rivers through the ice-covering, freezes again and again and makes formations of ice on top of ice, which can become kilometers long. If the water flows under pebble slopes, then the rock fragments are covered with concentric layers of ice, which are up to 10 centimeters thick. The boulders and pebbles then are entirely frozen in, but when the thawing weather comes, they fall into all the heavier movement (Arsenyev).

Despite the fact that the forms vary greatly in detail, the large, round, equalized lines of the mountain range nevertheless remain predominant in the overall impression.

The general forest covering contributes to this. Despite the 137 careless cutting down of trees in the border regions, this forest covering with its wealth of wood, especially of valuable deciduous trees, represents a still unexploited treasure of the Sikhote-Alin'. But the forest is not of the same quality everywhere. The great dampness hinders growth especially on the coast, where the trees are often crippled and covered with knots. The underwood is then all the thicker, and the natural wilderness is all the more difficult to penetrate. In the interior the forests become swampy easily, and even on the watersheds marshes form.

The picture of the present-day coast owes its origin to the old 133 forms of a heavily cut-up landscape submerged under the sea. Striking is the difference between the marked ria coast on the south and the more compensating coast on the east which has only a few bays. The causes of this morphological phenomenon have been investigated in great detail by Romer (168) and Nowak (134). They show first that

168. Romer, E. Bericht über geographischen Arbeiten im Gebiete des Sichota-Alin-Gebirges. /Report on the Geographical Works in the Area of the Sikhote-Alin' Range/ Anzeiger de Akademie der Wissenschaft Krakow, /Review of the Academy of Science in Krakow/ Series A. Krakow, 1913.

134. Nowak, J. Wissenchaftliche Ergebnisse der Expedition nach dem Sichota-Alin. /Scientific Results of the Expedition to the Sikhote-Alin'/ Krakow, 1913.

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the explanation of the older Russian scientists, according to which the strips of the layers and tectonic disturbances alone are the causes, is not tenable. In addition to a varying resistance /263/ capacity on the part of the rock (Romer), the different angle of inclination of the submerged land above all is made responsible for this phenomenon. The line where the water is 200 meters deep runs at a distance of 15 to 25 kilometers from the east coast, but on the south coast, west of Cape Povorotnyy, this line lies at a distance of 125 kilometers from the coast. The average drop on the east coast is 8 to 13 percent and exceeds by more than fivefold the drop on the south coast which is 1.6 percent. With the same power of the surf, therefore, the former ria coast on the east is completely destroyed, leaving only the slight remains of today, while the southern coast has been able to preserve itself. The varying strip direction, therefore, has only a subsidiary role, the essential reason being the varying submergence of a heavily divided landscape. This submergence occurred before the effusion of the lava coverings. The elevated basalt lava in the vicinity of the coastal locality of Sovyetskaya Gavan' is covered with sea deposits. The elevation here is very young.

Recent post-Quarternary vertical movements play the principal role in the creation of the coastal forms in detail, especially in the creation of the valley forms through the displacement of the basis of erosion. These post-Quarternary vertical movements are characteristic of a great part of the east Asiatic coast. These movements are indicated by beach stones, terraces, surf channels, old shore embankments, and layers with recent mussels at the most varied heights. According to the research of Dunikowskij (57) and Romer, there are five phases of these movements: 1. elevation of over 200 meters above the present surface of the sea; 2. lowering by 500 meters; 3. elevation by 150 to 200 meters; 4. elevation by 100 to 150 meters; 5. very recent lowering. The last phase of the lowering, however, touched only the extreme southern coast. Even at present this lowering has still not been concluded. On the east coast, on the

57. Dunikowskij, E.H. "Stratigraphische Geologie des Sichota-Alin" /Stratigraphical Geology of the Sikhote-Alin'/, Wissenchaftliche Ergebnisse der Expedition nach dem Sichota-Alin /Scientific Results of the Expedition to the Sikhote-Alin'/. Krakow, 1913.

other hand, an elevation still appears to hold sway at present. Many 133 rivers emptying into the sea show delta formations.

As a consequence of the southern current running along the coast, numerous narrow tongues of land separating small bays from the sea have formed. All these tongues of land point toward the south. The deltas mostly lie left of the river courses, which, therefore, show a wandering to the right and which also dig under the shore on the right side. The sea current is weaker and irregular on the southern coast, which is heavily broken up; thus tongues of land here can run in all directions.

The most important bay on the east coast is Ol'ga Bay. It was discovered in 1787 by La Perouse and forms one of the best natural harbors on the coast. Lying off the bay are the small, rocky Chikhachev Islands. The bay itself has a diameter of 3 kilometers and is on the mean 25 meters deep. Once it was at least three times as large and reached much more deeply into the land toward the west. Today the valley areas of the rivers emptying into the bay become swampy. When there is a strong east wind, a backward flow can even be determined. The old marine abrasion terraces are very well preserved on the mountains at a height of 25, 30, and 120 meters. The low mountains surrounding the bay consist of granite, quartz porphyry, and sedimentary rock and contain above all iron /264/ in addition to lead [135] ore containing copper and silver. This iron is magnetite with an iron content of 50 percent; the iron is being mined here. The harbor locality of Ol'ga has several thousand inhabitants. In the hinterland of the bay [261] Russian peasant settlers have made their appearance.

The Tetyuke Bay has a greater economic importance. Here, 316 35 kilometers from the coast, is the most important zinc-lead-silver 504 ore in the Far East. A narrow-gauge railroad connects the mining installations and the preparatory installations with the harbor, which has gotten modern loading equipment very recently. The harbor locality has several thousand inhabitants. Here, too, there are agricultural settlements in the hinterland.

Between the two above-mentioned bays is a third bay, the 133 Vladimir Bay. It is surrounded on all sides by granite mountains which are up to 225 meters high. The bay has a depth of up to 12 meters. Fresh water lakes and swamps enable us to recognize the former larger expanse of the bay. Two projecting rocky peninsulas enclose the bay. Vladimir is known for its installations for the extraction of iodine from seaweed.

•133 361 [504] [396] Of the more favorable bays on the northern part of the Sikhote-Alin' coast, only the bay is still to be mentioned on which the already-mentioned harbor of Sovyetskaya Gavan' lies. The natural bay, which is suitable as a landing place, has a vast, flat hinterland, which also has a rather thick agrarian population. Since the completion of the railroad constructed from Komsomol'sk to here, the locality has developed quickly into a city with more than 20,000 inhabitants. It has also received a modern harbor. The processing of wood stands at the center of the economy, but, in addition, ship construction is also pursued. The harbor has a floating dock for ships with up to 5,000 gross registered tons.

361 [505] For the rest there are in addition numerous small Russian fishing localities on the coast. These mostly lie at the mouths of rivers, and now, through the bringing together and the building up of the fishing industry, these localities are also experiencing a certain upsurge. The supplying of the localities is done by coastal steamer. Only where wider bays and more extensive valley areas have given the opportunity, have Russian settlers also made their appearance here. These settlers have in places already penetrated 50 kilometers and more into the land.

133 361 The real, vast mountain massif of the Sikhote-Alin' is very sparsely populated; indeed, large sections are uninhabited. In the pathless interior on the upper course of the Bikin and of the Khor, on the Mukhen, Anyu, and upper Khungari, the Tungus Orochi and Olcha are still to be encountered. They wander as nomads with their pointed tents and live exclusively from hunting and fishing. But their number becomes ever smaller. Otherwise only a few Russians and Chinese traverse the wilderness of the lonely valleys and mountains while hunting for fur-bearing animals and the antlers of Isiubr stag. The opportunities for agriculture and the breeding of livestock are slight. Only the broad bottom valleys of the main rivers are suitable for this; here, from the valley of the Ussuri on, Russian settlers are in the process of a slow penetration into the interior, especially on the Khor, Bikin, and Iman, in whose valleys /265/ they can already be found far in among the mountains. It cannot be said how much the collectivization of agriculture has contributed here to a further opening-up of the land or whether a perseverence on the land already won is the consequence of these measure.

137 Greater prospects for human activity are offered by the natural resources. Despite the careless cutting down of trees in the border

regions, the Sikhote-Alin' can still, as always, be designated as rich 137
in forests. Planned exploitation of these forests has still not been begun at all. Of still greater significance for the future are the vastly 135
rich resources of the ground. The southeastern part of the Sikhote-Alin' appears to be a true mine for the latter. However, a large part of these supplies has still not been once sufficiently investigated. The prospects for development along mining and industrial lines are always completely favorable, only an opening up in terms of transportation must pave the paths to the sources.

The extreme southern part of the Sikhote-Alin' is generally 361
relatively thickly populated, and it is also better opened up from Vladivostok on. It already belongs more to the cultivated zone, and economically, too, it is so closely connected with the cultivated zone that it will be treated in connection with the Ussuri-Khanka depression.

The Ussuri-Khanka Depression

The western foot of the Sikhote-Alin' is, for its entire length, 133•
accompanied by an extensive depression, which stretches from the Gulf of Peter the Great to the mouth of the Amur, thus covering more than 1, 300 kilometers. The Ussuri-Khanka depression forms the larger, southern part of this long depression and has a total length of 700 kilometers from the southern end to the mouth of the Ussuri. As compared with the Sikhote-Alin', this depression represents the sunken part of the land step and is accompanined on the west by the step, again elevated, of the east Manchurian mountain range. In the Tertiary period, the entire depression, as Ivanov (83) assumes, was flooded by the sea, and thus the Sikhote-Alin' projected from the sea as a long, narrow island. Proof of this view has been attained up to now only for the southern part of the depression.

The bulk of the depression belongs to the drainage area of the Ussuri. A flat watershed, which is scarcely perceptible in the countryside and which has an absolute height of only 190 meters above sea level, separates this section of the depression from that section of the depression whose waters drain off toward the south, i.e., the river

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83. Ivanov, D. V. The Sikhote-Alin' Ridge /in Russian/. Petersurg, 1896.

• 133 area of the Suyfun.

The Usssri comes from the southern part of the Sikhote-Alin' and arises from two source rivers: Daubikhe and Ulakhe. It flows first entirely in Russian territory, and, at the mouth of the Sungacha, which comes from Khanka Lake, it reaches the Manchurian border from where it then serves as the border river until it empties into the Amur. On the mean it is more than 420 meters wide in the lowland and flows languidly in a winding course with a mean velocity of only 1.5 kilometers per hour. The lower course of the Ussuri is often divided into several arms and becomes more than 1 kilometer /266/ wide. Numerous shallows hamper shipping, but the Ussuri is regularly traveled as far as Iman, where the steamer landing place is connected with the Ussuri Railroad by a railroad branch which is 1.5 kilometers long. Under favorable water conditions the Daubikhe is even traveled for a length of 100 kilometers as far as the locality of Lazarevo. However, the flow of water is generally very irregular, and also the summer high water changes greatly. Fluctuations in the water level occur, in which there is a difference of 10 meters between the extremes. Larger downpours of rain often cause the river to rise very rapidly, and thus unforeseen floods occur and cause much damage. The figures of Berg (27) show what great quantities of water can come down in such violent downpours of rain as are usual during the summer [132] monsoon. While in Voroshilov, the former Nikol'sk-Ussuriskiy, the normal mean rainfall for September is 105 millimeters, a single, mighty downpour of rain in one day brought the rainfall for that September to 115 millimeters. On August 9-10, 1927 in the same place 122 millimeters of rain fell within 22 hours during a cloudburst, which was connected with a typhoon-like storm.

The Ussuri depression extends on both sides of the entire course of the river, and in the north the depression melts into the Amur plain. The Manchurian side appears in this respect to be disfavored in comparison with the Russian side. The Manchurian side lies lower, and its swampiness extends over a much greater area than that of the east side. But here, too, a zone, which is exposed to floods, which is very swampy, and which is little suited to agriculture extends along

(27) Berg, L. S. Landshaftno-geograficheskiie Sony SSSR /The Landscape-Geographical Zones of the USSR/, Part I. Moscow, 1931.

the river. However, in contrast to the western side, the eastern side is narrow, and only somewhat wider at the mouths of the tributaries. On the other hand, the depression is also completely lacking in places, i.e., where the spurs of the Sikhote-Alin' go right down to the river. However, not only do these spurs interrupt the depressions, but they also often interrupt the hills and ridges which emerge from the flat alluvial plain and which are drier and as a rule have cultivated fields, villages, and forests. Therefore, there are only a few settlements [361] along the river in the areas threatened by water. The real cultivated zone, which begins in the north already at Khabarovsk, always extends, for this reason, at some distance from the river bank along the country lying higher. The Ussuri Railroad also follows the higher land. Here [311] the forest landscape and the forest steppe landscape have been cleared over an area 100 kilometers wide and have had to make way for the cultivated land, which extends in a considerable width especially in the regions around the lower courses of the Khor, Bikin, and Iman. The most important localities in these three depressions are Kondratyevka on the Khor, Bikin, and Iman, all three of which lie at the point where [361] the above-mentioned rivers are crossed by the railroad. In the south the Ussuri depression flows together with the agriculturally important Khanka depression.

Khanka Lake lies 69 meters high and is 23,000 square kilometers in area, with its greatest length being 80 kilometers and its width being 40 to 85 kilometers. A narrow, sandy tongue of land in the north separates it from the so-called Little Khanka Lake. /267/ /Sketch Map//268/ South of this tongue of land the border crosses the lake, giving approximately a fourth of the lake to Manchuria. In the east the Sungacha forms the border. Khanka Lake is generally extremely flat, its greatest depth being 10 meters. It is surrounded by vast swamps and moors covered with reeds, and it is very much in the process of being filled up with sand. The western shores are formed from Tertiary loam and are, therefore, hilly and irregularly formed with numerous bays and peninsulas. Here to the west of the lake lie the regions, which, of all the areas near the lake, are most favorable for agriculture. The flat moors and swamps which otherwise surround the lake extend to the north for 10 kilometers, and toward the east and south they even extend 30 kilometers from the lake, thus indicating the one-time size and position of the lake. Where the swamps surrounding the lake are becoming somewhat drier, they are turning into meadows with high grass, thus giving a similar appearance to that of the Amur prairies of the Zeya and Bureya.

•133 by a peaked series of hills, which are 50 to 100 meters high. However, individual hills all appear on the floor of the valley, from which they rise with very steep walls. Adjoining this area to the east is a gently rolling and irregular Tertiary hill country, which acts as a transition to the spurs of the Sikhote-Alin'. South of Khanka Lake and also in [137] the Suyfun depression numerous small oak forests have been preserved which give the picture of the landscape a varied and attractive impression. As a consequence of the good drainage the best agricultural land in the area is to be found in the Suyfun depression. But also in the Tertiary hill country agriculture is making good progress. Here are the /270/ most thickly populated sections of the Maritime Krai, in which, however, the entire region near the coast of the Bay of Peter the Great must be included.

563 Great Russians above all are settling in the Ussuri depression. Their weathered, colorless log houses which are built of wood, are 342 typical of the settlements in this area. Striking, however, in con- 241 trast to their homeland are the relatively flat roofs, which probably indicate the slight covering of snow which they have to bear here. Wheat, oats, and barley predominate in the appearance of their fields, but, in addition to corn, native plants, such as soy beans and perilla, are also appearing more and more. Ukrainians are the predominant settlers in the Khanka depression. As has already been indicated, this is based on historical reasons, since people from the Don above all were used in setting up the Ussuri Cossack formation of 1862. But it is still remarkable that it is Ukrainians who are in the majority in this almost treeless province. The bright color of their whitewashed mud houses dominates the settlements, and between the wheat fields corn comes strongly into the foreground. The Ukrainians here have also taken over for themselves the cultivation of sugar beets, just as they have in their homeland back in Europe. But, in addition, the yellow of the mud huts of the Chinese and Koreans also appears already in the individual settlements and in the village communities. These huts are often enclosed by the same mud walls; and in the flat, dammed-up fields there appears the light green of rice plantings, which are predominant in the damp area to the south of Khanka Lake. Further in the south toward the coast there is no longer a clear separation, but along the coast the Koreans increase. They often dress like Russians, but still they are more often dressed in the traditional white of the native clothing.

The breeding of livestock is pursued in the entire area: cows,

cultivated plants also flourish with great success. Very recently new 241
sowing and cultivation machines have been employed by the Soviet in the entire Far Eastern region, which is damp in the summer. These machines take account of all the conditions of that area. In the expansion of the cultivated areas devoted to soy beans, rice, beans, millet, etc., it has been shown that there has been more conversion to these in more recent times, following natural conditions. The [242]
noxious fungus, which prefers to attack the European types of grain, such as wheat, barley, and oats, has already been pointed out. This grain disease occurs in those damp warm regions in especially rainy years. As Arved Schultz (181) has observed, it is very characteristic that the fields of the Korean and Chinese peasants are attacked less than the fields of the Russians. There must, therefore, also be some reasons for this. In addition the fight against the Fusorien, of which a total of 22 types have been determined to date, has been taken up by the Soviet.

In contrast to the little populated eastern and southern sides 135
of Khanka Lake, the Tertiary hilly country to the west of the lake is thickly populated and is among the best agricultural regions. A rail- [496]
road line, which is 127 kilometers long, leads from the Ussuri Railroad into this region and ends right on the border in Turiy Rog at the northeastern end of the lake. On the eastern side of Khanka Lake, the cultivated zone, which continues from the north without interruption, 311
follows the Ussuri Railroad in a broad line, and with broad spurs into the valley of the Daubikhe and Ulakhe, the cultivated zone also penetrates toward the east into the mountain range. South of the lake the cultivated zone takes up the entire area from the Manchurian border to the mountain spurs of the Sikhote-Alin' and extends in an area of almost equal width via the Suyfun depression toward the south to the coast, where on the west side of the Bay of Peter the Great it extends farthest to the south in the coastal plain.

The watershed between the Ussuri and the Suyfun is flat and 133
scarcely makes an appearance morphologically. The Suyfun itself comes from Manchuria and crosses the border almost exactly at 44° latitude. Then it turns immediately toward the south to the sea. The valley area of the river is level and is accompanied on both sides

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181. Schultz, A. Das Ussuri-Land /The Ussuri Country/. Königsberg, Prussia, 1932.

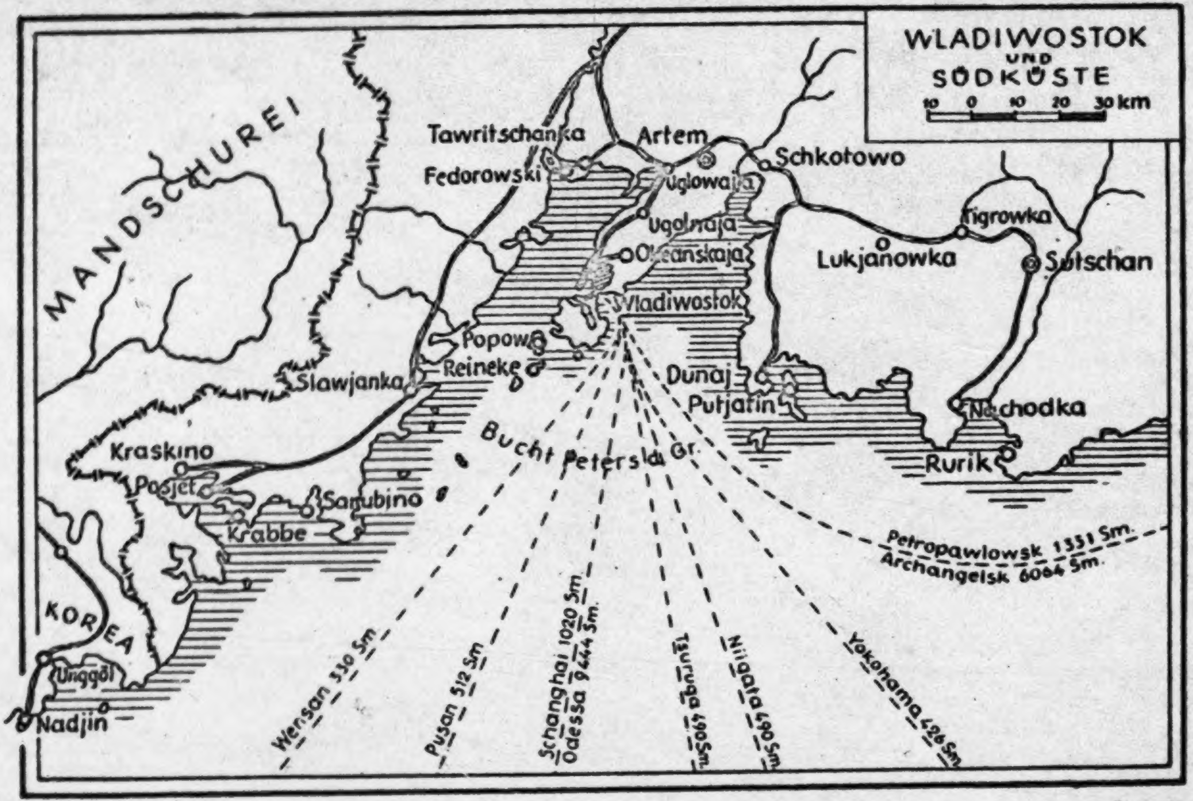
361 low ridges of the Sikhote-Alin' and enters the Muravyev-Amurskiy
Peninsula and finally reaches Vladivostok, the main town and the
most important harbor of the Soviet Union on the Pacific.

Vladivostok was founded in 1860. In 1872 the base of the
Russian Pacific naval fleet was transferred here from Nikolayevsk on
the Amur, and since then Vladivostok has been the center of the
military power of the land on the Pacific. Economically, however,
the city developed only slowly. In 1882 only 5,000 persons lived in
the city. At the same time somewhat regular shipping between
Vladivostok and the Black Sea harbors of Russia was taken up. However,
the city's rise to become the economic center of the land began
only after the construction of the Ussuri and Manchurian Railroad.
[504] Through this railroad Vladivostok first became an important Pacific
harbor, especially in transit shipping, and in this it is a harbor for
all of northern Manchuria. The more recent development of the city
into an industrial city has also kept pace with its development into
[161] an important harbor. In 1897 the city had a population of 21,000
persons; in 1914 it was 59,000; in 1926 it was 107,980; and in 1939 it
was 206,400. At present it is more than 300,000.

361 The city lies on the well protected and deep bay of the "Golden
933 Horn" at the southern end of the Muravyev Peninsula opposite the
504 large Russkiy Island, which is richly divided up. The peninsula and
the island are separated by the "Eastern Bosporus," which extends
from the Amur Bay in the west to the Ussuri Bay toward the east.
The harbor is unique and one of the best natural harbors in the world,
as the designations already indicate. The "Golden Horn" penetrates
from the south into the Murayev Peninsula and bends then almost at
a right angle toward the east (see map). /273/ /Sketch Map of
Vladivostok and the Southern Coast/4/ 274/ The north-south section
forms the outer bay and is 3 kilometers long; the west-east section
constitutes the inner, harbor bay and is 3.2 kilometers long. The
width of the "Golden Horn" is 800 to 1,000 meters; the depth in the
interior is 10 meters, and at the entrance of the bay it is 28 meters.
Mountains surround the bay and protect it from the cold northwest and
west winds. Mountains also rise 50 to 100 meters on the Shkota Peninsula,
which separates the outer bay from the Amur Bay. Nevertheless,
361 the harbor freezes for three to four months every year, and throughout
504 the winter three ice breakers are in uninterrupted service to keep the
harbor and the entrance free of ice. The outer bay and the western
part of the inner bay above all belong to the commercial harbor, while

4 [cf. cat. 116, p.317--Analyst]

Sketch Map of Vladivostok and the Southern Coast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Tigrowka
Sutschan
Popow
Reineke
Slawjanka
Dunaj
Putjatin
Nachodka
Rurik
Bucht Peters d. Gr.
Kraskino
Posjet
Sarubino
Krabbe
Unggöl
Nadjin
Wensan 330 Sm.
Pusan 512 Sm.
Schanghai 1020 Sm.
Odessa 9444 Sm.
Tsuruga 490 Sm.
Niigata 490 Sm.
Yokohama 426 Sm.
Petropawlowsk 1331 Sm.
Archangelsk 6064 Sm.

18 Sowjet-Fernost

/278/

3: Thiel--317 K-4,5(no date) 1953

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137 appear extensive moss steppes, which have a similar character to that of the tundra, and these regions have an almost polar appearance. The south, on the other hand, has milder traits in places. Since rich
135 coal and oil supplies have been discovered in very recent times and since their exploitation has begun, the island is sliding more and more into the foreground of economic interest; the population is increasing rapidly and is adapting itself to the island. With this the bad reputation of the island is also beginning to change.

According to the relief, Sakhalin is divided into two parts: a
133 larger, mountainous section in the south, and a smaller section in the north which is gently rolling to hilly. The mountainous south consists of two mountain chains, which run in the direction of the island and which are separated from one another by a depression stamped as a longitudinal valley. The depression is drained toward the north by the Tym' and toward the south by the Poronay.

/278/ The eastern mountain range, whose highest elevations are Nevel'skiy Mountain (2,013 meters) and Lopatin Mountain (1,680 meters), is more heavily divided up than the western mountain range, which also is lower generally and whose highest point, the Aimi Yama, reaches only 1,641 meters. In its external impression, the eastern mountain range should be designated as more of a ridge mountain range. It consists principally of metamorphic rock, slate, sandstone, and limestone which is similar to marble. These are the same stones as those which build up the border chains of the mainland. These sedimentary stones are in many places permeated by syenite, diabase, andesite, and basalt. Granite, however, is lacking. In terms of age, most of the sediment of the eastern mountain range is reckoned as Paleozoic. Mesozoic is diffused only in places and then is only slightly developed. It is different in the western mountain range. This is built predominantly from Tertiary layers, beside the older rock. Jurassic and Cretaceous also lay claim to a significant proportion. Cretaceous appears especially in the southwestern part and is diffused in the former Japanese territory. Weathering effects are very great because of the damp climate; they affect especially the parts of the mountain range without forests. The sharper forms and the greater variety in the relief can be traced back for the most part to the varying powers of resistance of the different types of rock. The loamy and gravelly slate weather especially quickly.

The Tertiary deposits, which have a wide diffusion in all of Sakhalin, and the Cretaceous sediments are heavily destroyed. The mountain-forming occurrences, which determine the relief of today, began after the deposit of the most recent, Pliocene Tertiary layers and ended still before the Quarternary sea transgression, whose sediments are here deposited almost horizontally. But the present-day mountain ranges of Sakhalin cannot be traced back to Tertiary dislocations alone, for earlier, in a period of the earth's history which has still not been determined exactly, the older layers were already folded up into a mountain range, running in the same direction as today's mountain ranges. Thus in the Tertiary period only a new forming occurred. The post-Pliocene transgression separated Sakhalin from the mainland and flooded all the low-lying sections of the island. It even penetrated between the two mountain ridges, so that these mountains projected from the sea as large, high islands. (207). Later, in elevations following one another at several intervals and perhaps interrupted also still by lighter depressions, the island then emerged from the sea in its present form. Even today these movements have still not been concluded, as is indicated by the earthquakes which have been recorded up to the present. Traces of glaciation are nowhere to be found.

The longitudinal valley between the two lines of mountain ranges is to be regarded as a graben depression. It is 5 to 30 kilometers wide, and in its entire length it is covered by post-Pliocene sea deposits. The watershed, which separates the Tym' which flows toward the north from the Poronay in the south, lies only 150 meters high. /279/ The floor of the valley is mostly level and is covered with a fertile loamy soil. Protected by the two lines of mountain ranges, the valley has a more continental climate, with the warm summers corresponding to its southern location. Accordingly many Russians have settled here in a series of villages.

Toward the north both lines of mountain ranges move back from the coast, quickly become lower, and go over into a hill country, which fills the interior of the northern part of the island with gently rolling ridges which never project 500 meters. Thereby the two ridges and also the longitudinal valley still distinguish themselves in the relief far toward the north. The coast itself is followed by a broad plain,

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207. Tanfiliev, G.I., Geografiia Rossii: Relief Aziatskoi Rossii /Geography of Russia: The Relief of Asiatic Russia/, (Odessa, 1923), Vol. II, p. 265.

133 [137] which consists of recent and post-Pliocene deposits and which for the most part is covered by a tundra vegetation interlarded with bushes. The extent of this plain varies, being largest in the north around Sakhalin Bay. The plain ends in a 2 to 6 meter step which is delineated rather sharply everywhere. With this step the hill country then begins. This hill country as a rule bears a thick taiga consisting of spruces and larches. The watershed regions are scarcely perceptible in the relief, but they show up in thicker and higher forest growth. In places the hill country step also goes to the coast itself and then forms a higher, steep slope, which can reach 15 to 26 meters. (207) Taiga and sea then come very close to one another.

Schmidt Peninsula, so named in honor of the well-known Sakhalin explorer, forms the extreme northern end of Sakhalin. This peninsula forms in miniature a true model of the geological and tectonic structure of the southern section of the island, with even the intrusive phenomena being the same. Here, too, we find an eastern mountain range and a western mountain range with a depression lying between. In the "Tri Brata," the "Three Brothers," the eastern mountain range reaches a height of 708 meters. For the most part this range declines steeply to the sea, and in the north it forms the rocky Cape Elizabeth, the most northerly point on Sakhalin. The western line of mountains, which likewise declines steeply to the sea, attains a height of only 406 meters. The depression lying in between ends in the north with a lake, which is separated from the sea by a narrow tongue of land. On the land narrows which connects Schmidt [315] Peninsula with the main part of the island lies the oil fields of Sakhalin which today have the richest yield.

Sakhalin's coast is generally but little divided up. In contrast to the more contiguous western coast, the northern coast and the east coast represent typical coasts with alluvial lands and numerous fresh-water lakes. Baykal Bay in the northern part of the island represents [505] the largest fresh-water lake. It can be traveled by coastal ships with a draught of up to 3.5 meters. Here on the eastern side of the bay lies Moskal'vo oil harbor, which has a railroad connection to the oil region in the eastern part of the peninsula. Still more strongly marked

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207. Tanfiliev, G.I., Geografiia Rossii: Relief Aziatskoi Rossii /Geography of Russia: The Relief of Asiatic Russia/, (Odessa, 1923), Vol. II, p. 266.

133 is the alluvial land character of the eastern coast, on which there is one fresh-water lake after another, almost lined up in a row. All these lagoons are extremely narrow, but they are up to 160 kilometers long. In contrast to the restless sea, these lagoons permit /280/ a protected water traffic along the coast. Sandy places with dune formations, however, are only rarely to be found here. [135] Mostly vast, tundra-like moss steppes, which consist of peat layers up to 15 meters thick, spread out here on the lower courses of the rivers, and are especially extensive on the Tym'. Here, as on the western side of the island, these steppes are excellent meadow lands for reindeer herds.

The difference in the coastal formation between the western and the eastern parts of the island can be traced above all to the prevailing current. On the eastern side the current goes along the coast toward the south. On the western side a current toward the south prevails within the Tatar Sound on the coast of the continent, while on the coast of Sakhalin an opposing northern current predominates. This northern current, however, as Zhdanko (188) has indicated, does not run regularly; rather the current changes in connection with the tides; thus there are only tendencies toward an irregular level coast.

137 Climatically the low northern part of Sakhalin is the most disfavored, since no limitations are set to the raw influences of the Sea of Okhotsk. Therefore, the appearance of the Daur larch is just as typical here as the appearance of the Ayan spruce. Toward the south in increasing measure the taiga also has deciduous trees of the same type mixed in as are characteristic of the Sikhote-Alin'. A consequence of the damp climate is not only the moss areas near the coast but also the meadows which appear in the more protected flood plains of the rivers. These meadows have a very heavy growth of grass, which in places is 3 to 4 meters high. Senecio cannabifolia and Petastes japonicus should be mentioned as among the principal types represented here. In the mountains themselves the stone birch, Betula ermani, appears as the characteristic tree in the heights as do the spruces and pines. In more protected valleys stocks of pure deciduous trees are no rarity. Worthy of note is the appearance of wild Kuril

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188. Zhdanko, M. "Isvlechenie iz doklada v zasedanii I.P.G.O." Excerpts from the Material at the Meeting of the Geographical Society in 1915/, Izvestiia of the Imperial Russian Geographical Society, 1915.

The harbor has in very recent times been expanded and provided with 361 [504] modern loading equipment. Since the Tatar Sound is very shallow, this equipment had to be moved very far out into the sea. To be mentioned in second place is Okha (approximately 25,000 inhabitants), the most important center of the oil region on the northeastern coast. During the last war the city got a sea harbor of its own, which is supposed to be usable throughout the entire year. South of Okha lies 315 Ekhabi, which has often been mentioned recently for its rising oil production. A railroad and an oil pipe lead from Okha to the oil harbor of Moskal'vo, which lies on the eastern side of Baykal Bay in the northern part of the island. Furthermore, in the past few years there have 226 been established along the coast numerous, permanently inhabited fishing bases, which give life to the entire picture along the coastal strip. The largest part of the interior is still untouched and given over even today to the native population and their primitive economy.

In southern Sakhalin (Karafuto), which was formerly Japanese, 135 the natural lanscapes continue as they have already been generally described. The western mountain range, which here has heights of up to 1,375 meters, forms the backbone and stretches to the south beyond the 46th latitude, while the eastern mountain range already ends north of the 49th /282/ latitude. The Poronay Valley ends even before that after it has spread out to a width of 30 kilometers.

As in northern Sakhalin, so here, too, the largest part of the 137 land is covered with primeval forests, which consist of the same type of trees as in the north, only here the percentage of deciduous trees is larger and increases especially on the lower slopes and last spurs of the western mountain range. Even though the climatic conditions became somewhat milder with the southern location, tundra-like moss [231] steppes appear here also. Reindeer breeding is still pursued today by the native population, the Orok and the Tungus.

The population of southern Sakhalin was 332,000 in 1936 and 161 412,000 in 1940; the increase can be traced for the most part to immigration from Japan. Of the old, native peoples scarcely 2,000 existed; of these the Ainu, who number 1,500, constitute the main part. The rest is divided among Gilyak, Orok, and other Tungus tribes.

The economic importance of southern Sakhalin lies in the 489 wood supply of its forests, in its coal deposits, and in the wealth of fish in the waters near the coast. The Japanese have done much for the economic development of the land and also have attained much. Above all they are to be thanked for the opening up of the land through

The Region of the Amgun and the Uda

This area comprises the entire, heavily divided up coastal strip on the southwestern corner of the Sea of Okhotsk from the river area of the Amgun in the southeast to the river area of the Uda in the northwest. In contrast to the better known coast, the interior of the land, especially between the Bureya Mountain Range and the coast, is still very little explored. The raw Okhotsk climate with its heavy rainfall, the heavy swampiness of the valley areas, the thick taiga of the mountains, which is difficult to penetrate and which is interlarded with high moors, and the lack of habitation of the regions offer few inducements to explore these regions.

The general character of the landscape appears to be greatly varied. Low, forested mountain ridges give way to higher lines of mountain ranges, and in between lie deeply sunken flat valleys, which often spread out into vast plains. The lines of mountain ranges stretch predominantly toward the northeast and represent in places heavily destroyed continuations of the Bureya Mountain Range and also spurs of the Dzhagdy Mountain Range. Some mountain ridges press into the sea as peninsulas, while the bays in between appear to represent broken-in grabens. Numerous small and large islands, which lie off the coast and which are summarized under the name of Shantar Islands, increase the impression of a mountain landscape sunken in the sea. Three large bays press far into the land from north to south: the narrow Nikolya Bay in the east, which is 50 kilometers long and up to 20 kilometers wide, the wide Ul'ban Bay in the middle, and the Tugur Bay in the west, into which the river of the same name empties. In contrast to these three richly divided bays of the sea, the large Uda Bay projecting toward the west appears monotonous.

The coast is for the most part rocky in its entire course from the mouth of the Amur to the mouth of the Uda. It is especially rocky in those places where the lines of mountain ranges and mountains stretching there break off steeply at the coast. These mountains consist mostly of loamy and gravelly slate and sandstone, /248/ which are laid in more or less steep faults stretching toward the northeast. Less commonly granite and porphyry appear between the sedimentary rock. Where this is the case, these mountains can be recognized from a distance in relief with their massive, peaked forms. The beach plains and the floor of the sea are saturated with remains of mussels, especially of Balanus, Cardium californiense, Natica aperta, Trochus schantaricus, etc. (127) The sea narrows between the Great Shantar Island and the mainland is very shallow and nowhere exceeds a depth of 23.8 meters. Between the individual islands the sea is still shallower, and Yakshina Bay, which penetrates to the south of Great Shantar Island, is not navigable at all for ships at the time of ebb-tide. The line at which the sea becomes 50 meters deep leads from the northern tip of Sakhalin Peninsula directly toward the west and encloses the entire island world; thus here this line runs 100 to 125 kilometers from the coast of the mainland; while on the Okhotsk coast, stretching to the northeast, north of the Uda Gulf the sea is 200 meters and more deep already at a distance of 5 to 10 kilometers from the coast. Between the islands and especially also in the bays, the tides make themselves strongly felt, the local fluctuations in the level of the water reach 4 to 7 meters. The raw influence of the Sea of Okhotsk, which affects the entire province, is caused among other things by the sea current stretching from the northeast along the coast. This current brings large ice masses from the north in the spring and piles them up between the islands and on the mainland coast. On the coast stretching toward the southeast between Nikolya Bay and the mouth of the Amur, a leveling coastline has formed as a consequence of the equal current, and thus lagoons and narrow tongues of land appear here. Also the collecting of sand in the "Amur-Liman" in the north between the mainland and the northern end of Sakhalin Island is a disadvantage which the sea current brings. Great Shantar Island consists of the same geological material as the mainland mountain range which stretches toward the northeast; thus Great Shantar and the entire island group can be regarded as parts of the mainland torn away by the sea. Great Shantar Island consists of a maze of forest-covered summits and mountains, which are up to 1,000 meters high. In between, vast moss moors, swamps, and lakes cover the surface. The other large and small islands are also in part covered withforests and make a picturesque scene with their rocky formation. All the islands are uninhabited.

The Amgun has a total length of more than 800 kilometers, of which around 400 kilometers are designated as navigable. The

127. Meglitskii, G. "The Shore of the Sea of Okhotsk and the Tungus Region" /in Russian/, Gornyi Zhurnal, No. 8, 1893.

river comes from the eastern slope of the central Bureya Mountain Range and flows next between this mountain range and the Badzhal'skiy Mountain Range toward the northeast. Then the Amgun enters a low plain, which here, on the middle course of the Amgun, spreads out to a great width of up to 100 kilometers. In this plain very important rivers flow into the Amgun from all sides. Among these is the Kerbi, which also comes from the west. The area rich in gold around the upper course of the Kerbi was already mentioned earlier. The low plain, from which individual hills and mountains project directly, is filled with moors, /285/ swamps, and lakes. Best known of these lakes is the large Chukchagirskoye Lake, which has a large number of islands. A broad and likewise damp valley area remains with the Amgun on its further course. In the north and south this valley area is followed by a highland, which is covered with forests, which has gentle slopes, and which is up to 500 meters high. The heights of this highland also occasionally come right to the river and then often form steep drops. Notorious is the area around the lower course of the Amgun, which spreads out widely and flows together with the Amur lowland. The drop here is so slight that the Amgun dissolves into a vast number of arms, still waters, and long extended lakes and must wind through the terraine in large and small bends.

The vast, flat swamp and moor plains produce an entirely different picture here from the meadow steppes of the Amur plains. The Amgun plains are, of course, also generally flat, but they are in many cases given a somewhat uneven form by clusters of grass and moss hills, between which blank water often shows through. But the long, irregular strips of forests and bushes constitute the greatest difference. These strips twist through the wide plains and follow the river courses on both sides like gallery forests, causing the river courses to be visible from a distance. On the Amgun the forests consist predominantly of deciduous trees. It is typical of this entire cool and very damp region from the Amgun to the Uda that the forest settles only on the better-drained spots where the surface water and the ground water is in motion, i.e., on the rivers and the slopes. The flat ridges or plateaus are again more unfavorable. On them high moor formations appear often as enemies of the forests; thus the trees become "water-seeking" and gradually decay. The traveler, therefore, must always keep away from the valley bottoms and use the ridges and heights, even though these project only a little. However, often here, too, he encounters a jumble of pathless flat and high moors in the flat watershed regions, and thus he can still go forward best along the slopes.

000 watershed regions, and thus he can still go forward best along the slopes.

361 The Amgun region is as good as uninhabited. Only on the largest rivers is human life to be encountered here and there: wooden huts of some Gilyak or also of Tungus Olcha and Negidal, who live from fishing and hunting. On the Amgun itself, however, there are already Russian settlers, who have come together into some small localities. The most important is Kerbi which lies at the mouth of
505 the river of the same name. The Amgun can be traveled by small steamers as far as Kerbi. The Amgun brings goods to supply the area here, and the goods are then towed in boats down the Kerbi to the gold regions.

133 The valley of the Tugur becomes up to 20 kilometers wide and gives the same picture. Here, too, moss moors extend far down the valley. The swampiness is strengthened here still more by the appearance of permafrost.

/286/ The river area of the Uda is very extensive. In the Uda collect waters which come from the Dzhagdy Mountain Range and also from the Dzhugdzhur Ridge. The Uda's left tributary, the Maya, which is more than 300 kilometers long, separates the Stanovoy from the Dzhugdzhur. Here, too, the great swampiness causes the traveler great difficulties. The Uda is a mountain river and flows seethingly in a bed filled with boulders and interrupted with numerous rocky islands. Only in its lower course does the Uda become quiet. Here lies Udskoye, a small Russian village, which is the center of the hunting of fur-bearing animals. This hunting still brings very rich yields in these remote mountain regions.

The Okhotsk Coastal Area

The area includes the entire western and northern coastal region of the Sea of Okhotsk, beginning at the Uda in the south and ending at Penzhina Bay in the north. With the coast being more than 2,000 kilometers long, the conditions, of course, vary in detail, but in general the prevailing character of a raw mountain forest landscape with a damp and cool climate is preserved, which is less tolerable for man than the harsh contrasts of the continental interior.

The region can be divided into two parts according to the structure of the coast and according to its forms: a southwestern part between the Uda and Okhotsk with coast which is little divided up and a northeastern part which is heavily broken up by numerous large and small bays, peninsulas, and islands. The character of the southwestern part is determined only by a line of mountains stretching parallel to the coast, the Dzhugdzhur; in the northeastern part ridges of mountain ranges are predominant which stretch irregularly toward the line of the coast. /33

In the western part, the Dzhugdzhur coast, the mountain ridges go right down to the sea and leave free for settlement by man a narrow coastal strip, which at most widens somewhat at the mouths of the rivers. The Primorskiy Ridge, which lies in front of the Dzhugzhur chain in the south between the Uda and the Ayan, even declines directly and steeply into the sea. The Dzhugdzhur, which stretches parallel to the coast and consists of several ridges, forms a contiguous mountain wall with its masses formed predominantly of granite, gneiss, and porphyry. This mountain wall shuts off the coast from the interior. The mean height exceeds 1,000 meters, and the few unprotected passes also lie almost as high. The watershed runs in the vicinity of the coast, and thus along the entire coast only short rivers, which, however, seethe because of the steep slope, flow down into the sea. Therefore, the deeply etched valleys opening on the sea stand in sharp contrast to the more horizontal lines of the round peaked surface of the massif of the mountain range. The valleys are filled with thick /287/ taiga, teeming with underwood, and, with the narrow bottom of the valley saturated with boulders and scree, these valleys offer man only a very difficult opportunity to penetrate into the mountain range; and yet these sharply etched and steeply rising valleys are the sole routes which lead from the coast into the interior of the land. Thus the fact that the coastal strip is cut off from the hinterland is a special mark of this region. The ridge is more thickly forested only on the slopes, while the heights themselves have only a spotty, crippled growth of trees or lie completely bare in the highest places. The passes, too, mostly lie above the tree line and are scarcely usable in winter as a consequence of violent snowstorms.

The interior of the mountain ridge is as good as uninhabited. 361
Apart from hunters, only a few Tungus with small reindeer herds cross 505
the desolate mountain areas. On the coast there are a series of Russian fishing settlements. The principal locality here is Ayan. It lies on a favorable natural bay, which is approximately 1 kilometer both long and wide and 6 to 38 meters deep. Since the entire Dzhugdzhur coast blocked by ice in the winter, the harbor can be used only in summer, although constant violent sea winds often hamper the departure of sea

361 ships and indeed in many instances make departure impossible. From
505 Ayan a route starts toward Yakutsk. This route rises steeply over the
mountain range to Nel'kam on the Maya, a left tributary of the Aldan.
From here the rest of the way is on the rivers, via the Maya, the Aldan,
to the Lena. Ayan, which is notorious for its heavy rainfall, cannot
really make progress despite its favorable natural harbor; and, although
the beginnings of its development reach far back, Ayan has scarcely
1,000 inhabitants.

361 In the north the Dzhugdzhur Ridge bends away from the coast
and makes way for a vast coastal lowland which penetrates deeply into
the land. Here, at the mouth of the Okhota, which forms a good natural
harbor, lies the village city of Okhotsk, the first and oldest harbor of
the Russians on the Pacific. In addition to a telegraph line, Okhotsk
has a land route connection with Yakutsk. The use of this route causes
fewer difficulties than the route from Ayan. At present Okhotsk is an
563 important fish collection point. On the coast and also in the hinterland
241 of the depression, numerous Russians have settled. In addition to an
231 agricultural economy based on the cultivation of potatoes and vegetables,
these Russians devote themselves to the breeding of livestock, which
does very well here in the natural meadows of the alluvial plains.
Tungus Lamut have joined the Russians, too. These Lamut, in addition
to fishing, devote themselves also to agriculture, which they have taken
over from the Russians. They apply themselves with the same care to
the ox as for generations they have done with the reindeer. Farther in
the hinterland of the lowland there are still Reindeer Tungus in large
numbers. These Tungus wander as nomads between the bottom of the
valley and the mountain tundra.

•133 Northeast of Okhotsk the coastal provinces /288/ have another,
more varied character. There is not, as is often still represented on
many maps, an interrelated mountain chain which runs parallel to the
coast; at least there is none between Okhotsk and the Yama, a river
east of the P'yagina Peninsula. On the contrary, east of the Okhotsk,
spurs of the Cherskiy Mountain Range run into the coast almost at right
angles, and between these spurs relatively wide and long valley areas
stretch from the coast far into the interior. In addition, in order to make
the picture more colorful, there is farther to the east another orographic
element, which is limited, however, to the peninsulas and islands.
This is a heavily destroyed and broken up mountain chain, which runs
approximately parallel to the coast and which, according to the present
level of knowledge, is reckoned as belonging to the inner arc of the

Tertiary fault mountain range zone of East Siberia. On the one side, 133 this mountain chain is supposed to have been connected with Sakhalin, and on the other it is supposed to appear again in the Taygonos Peninsula, in the western part of the Penzhina depression, and in the northern part of the Anadyr' region. In the coastal region this chain appears characteristically in the Chutnavar Mountains, which stretch in a wide peninsula from west to east and which are separated from the mainland mountain ranges by an extensive valley which runs in the same direction. Through this valley flows the Kaza Tau'. The mainland mountain ranges referred to above are spurs of the Cherskiy Mountain Range, and with their ridges and the valley areas lying in between, they run into the Kaza-Tau' valley almost perpendicularly; thus in a narrow area the opposing construction appears clearly. For the rest the Tertiary mountain chain appears only in island remains, on the Koni and Pyagina peninsulas and then on Taygonos Peninsula.

East of the Yama begins the Kolyma Mountain Range, which from here on stretches toward the northeast parallel to the coast and then in the hinterland of the Taygonos Peninsula turns toward the north-northeast into the interior of the land. But, in contrast with the Dzhugzhur, the watershed lies far from the coast. The mountain range slopes toward the coast and is broken up into individual parts by numerous long and relatively wide erosion valleys, which run almost perpendicular to the coast. Thus the general impression remains the same as in the west between Okhotsk and the Yama, where the spurs of the Cherskiy Mountain Range meet the coast at the same right angle. However, in the coastal region of the Kolyma Mountain Range the valley areas and also the coastal plain are smaller in size. In the background of the Gizhiga Bay, between the Kolyma Mountain Range and the Taygonos Ridge lies an extensive depression, which is filled with Tertiary deposits. In this depression coal-bearing layers have also been discovered in very [135] recent times; these layers contain industrially valuable deposits of brown coal and lignite. Natural outcroppings of the productive seams are even to be observed on the coast of Gizhiga Bay.

The northern location comes out more and more in the landscape 137 picture of the coastal region east of Okhotsk. The protected valley areas are as a rule covered with good meadows, which offer /289/ usable pastures for cattle and horses and which are also rich in hay fields. The courses of the waterways are followed by meadow bushes and rows of poplars. Birches set in toward the upper courses. The slopes are mostly covered with larch forests, which become light and low in the heights.

same time created the shortest connection with the entire Kolyma 491 region. The highway is more than 1,000 kilometers long and was built under the most difficult of conditions (mountain ranges, permafrost). Bases connected with small agricultural economies /290/ facilitates the use of the road. The harbor of Magadan lies on Nagayevo Bay. Steep rocks are artificially heaped up at the foot of the landing 361 places for sea-going ships. Ice breakers are employed in the harbor [504] to make it possible to use the harbor for a longer period. The rapidly growing city, which in 1939 already had more than 10,000 inhabitants and today is estimated to have 50,000 inhabitants, lies somewhat at a distance from the harbor and is separated from it by a flat, rocky hill. The construction of the city was done with the most modern means. They have even succeeded in building stable six-story skyscrapers, despite the permafrost, by using deep excavations and by laying in insulating layers.

The Provinces of the Extreme Northeast

These regions are bordered on the west by the Kolyma Moun- 133 tain Range, and they are divided into the Chukchi Peninsula, the Anadyr' and Penzhina region, and the Koryak Mountain Range. Of these areas only the strip along the coast is better known; the vast interior, on the other hand, is mostly still insufficiently explored.

The Chukchi Peninsula is cut off from the Asiatic contintent on the one side by Chaun Bay on the Arctic Ocean and on the other side by Anadyr' Bay on the Bering Sea. The southern border is formed by the Anadyr' Mountain Range, which represents the watershed between the Arctic Ocean rivers and the Anadyr', and which is more than 1,000 meters high. The region north of the Anadyr' Mountain Range is also filled with lines of mountain ranges almost as far as the coast of the Arctic Ocean. These mountain ranges stretch in a direction from west to east. Further toward the east the contiguous, broad mountain landscape is lost, and the mountain ranges form themselves into two ridges which lie under 800 meters and which, broken through several times by rivers, reach the east coast with the northern mountain range going in the direction of Cape Dezhnev. The cape itself, which lies 77 kilometers from the mainland of Alaska, consists of a single, massive mountain which is 770 meters high and which is formed from limestone. This mountain is completely isolated and is connected with the mainland only by a low, narrow tongue of land, which is

.133 covered with tundra. Thus from the sea the cape looks like a mighty island, which in its layout vividly recalls the rocks of Gibraltar. The northern and also the southern mountain chain consist predominantly of gneiss and granite. In the Anadyr' Mountain Range Mesozoic rocks are already drawn into the faulting, and south of this range Tertiary layers are also drawn in; thus from north to south one encounters more recent mountain formations.

As a consequence of the easier accessibility the coast of the Chukchi Peninsula is very well explored. Shelagskiy Cape on the eastern side of Chaun Bay is approximately 950 meters high. Further to the east the mountains, which are 600 to 800 meters high, fall back and make free a broad coastal plain with lakes and beach formations full of lagoons. These beach formations, however, are here and there interrupted by round humpy mountains, in which the basic stone /291/ projects from alluvial land plains. At Kolyuchin Bay the mountains again go right down to the sea. Cape Serdtse-Kamen' has heights of [654] from 600 to 900 meters. Eight polar stations have been erected on the coast of the Arctic Ocean on the Chukchi Peninsula to observe the climatic and especially the ice conditions for the benefit of shipping. These stations are distributed over the Chukchi Peninsula at almost equal intervals. All are equipped with radio stations and are supplied for the most part by airplane. The eastern and southern coast of the peninsula, where the mountain ridges often go down to the sea, is richly divided by various bays. From Anadyr' Bay, KerstaBay penetrates farthest into the land. On a side arm of Kresta Bay lies the highest elevation on the Chukchi Peninsula, the Matachingay. With its 2, 800 meters it dominates the mountains surrounding it which are 600 to 800 meters high. At its foot andesite appears, and thus one can probably correctly assume the mountain to be a volcano formation.

137 The bulk of the Chukchi Peninsula is covered with tundra, which makes for a very varied picture according to the relief. Swampy depression tundra, interrupted on the courses of the rivers by pasture and birch underwood, appears only in the valleys and plains. Of greater value is the dry mountain tundra, which is covered with good reindeer moss. The mountain tundra traverses the flat ridges of the mountains and insure the existence of the great reindeer herds of the Chukchi. The higher mountain ranges and mountain peaks are completely without vegetation and are richly sprinkled with rock ruins. Growth of trees occurs very rarely. It is limited to individual, protected spots. Only in the valleys opening toward the south into the Anadyr' region do

smaller forests appear, and then mostly with badly gown and crippled 137
trees.

Permanent settlements exist only on the coast and those are 361
mostly on the Bering Sea. In them live the Maritime Chukchee who 563
devote themselves to the catching of fish and sea animals, and in
some villages there are also Eskimo. The sections of the sea near [225]
the coast of the Chukchi Peninsula are especially rich in walruses,
which are among the main animals hunted here. There are no larger
localities. Except for officials, no Russians remain here permanently.
The interior of the peninsula is occupied by Reindeer Chukchee, a
powerful people, capable of resistance, who own great herds and who
are depicted as excellent in the breeding of reindeer. However, be- [161]
cause of their small number the general density of population is very
low and reaches only approximately 0.03 per square kilometer, and
thus one can traverse great stretches without encountering a man.
Very recently exploration has uncovered valuable natural resources in 135
numerous places. Thus, iron ore, copper, mine gold, graphite,
molybdenum, and also hard coal have been found. Hard coal out-
croppings are known directly on the coast of Mechigmenskaya Bay
and also in the environs of Cape Serdtse-Kamen'. Pieces of hard
coal of excellent quality were also found by Chukchee in the interior.
/292/ The greatest part of the natural resources determined to date
lie on the east coast, since this alone has to date undergone a more
exact investigation. The findings to date permit one to assume, on
the basis of the same geological structure, that there are more deposits,
and thus in them perhaps one side of the future development of the
Chukchi Peninsula is indicated.

The Anadyr' region lies south of the Chukchi Peninsula and is 133
bordered on the west by the Anadyr' Plateau and on the south by the
Koryak Mountain Range. The central part of this region is taken up
by an extensive depression, which is filled with Cretaceous and Tertiary
deposits. For the most part this depression is completely level, but it
is not unified, for from the north as from the south mountain ranges
project into the depression or rise directly from the plain. To the
south of the Anadyr', east of its tributary the Mayn are the Alganskye
Mountains, which are up to 500 meters high. The course of all these
mountain chains and mountain ridges has still been very little explored
in detail.

The Anadyr' comes down from the plateau of the same name,
and in its upper course, where it is up to 170 meters wide, it has the

•133 appearance of a large mountain river. The high banks already here have good larch forests. In the area around the upper course of its left tributary, the Belaya, which comes from the Anadyr' Mountain Range in the north, there are supposed to be, on the other hand, only poplar forests and no larches. Above Markovo, the principal locality in the interior of the region, the wide plain begins. At Markovo, more than 500 kilometers from its mouth, the river lies only 25 meters above sea level, and thus the drop from here on is very slight. The middle course of the river, therefore, extends over a width of up to 1.5 kilometers and includes numerous islands. The depression, especially the central parts on both sides of the river, traverse wide, lightly hilly, moss-covered swamp areas with numerous large and small lakes and river courses with water which scarcely flows. There are [137] no forests at all in the depression. West of the Belaya and to the southwest of the basin, the swamp areas here and there still have bushes of alders, poplars, and willows, but toward the east this, too, disappears, and here the landscape picture appears monotonous and can be surveyed over a vast area. Also the spurs of the mountain range and the ridges are mostly flat and covered with a slimy moss covering. Often the mountains still have lakes and brightly iridescent swamp areas on their ridges.

To the north of the Anadyr' depression, as was already mentioned 137 with the Belaya, only poplar forests occur in protected places. Larches are generally rare there. Only south of the depression do they also /293/ appear. In the west, on the other hand, i.e., more removed from the damp-cool influence of the sea, larch forests penetrate into the valley areas and onto the slopes much farther to the north. The transition from the depression to the mountains occurs in the same way almost everywhere. As a rule, poplars and willows, but rarely birches, set in first on the river courses, and, widening into a type of gallery forest, these trees accompany the river even into the mountain range. For this the trees take up the valley bottom, while the slopes are already traversed by coniferous forests. The slopes exposed to the winds and the higher ridges, however, are without forests.

The fact that the Anadyr' depression opens onto the sea per- 132 mits the influence of the sea to penetrate far into the land. In the west temperatures of -50° are no rarity, while that degree of coldness appears only as an exception in the east. In summer, on the other hand, the coast is cool and rainy, while in the west there are very warm days. The cool fog which envelopes the coast in summer almost never penetrates into the land, however.

almost never penetrates into the land, however. 000

The area occupied by settlements is very slight in the east and 361 in the center of the depression. In the west, on the other hand, there 563 are a series of villages on the Anadyr' and its tributaries. Among these, Markovo with its approximately 500 inhabitants has first rank. Russians, too, live in the villages, but otherwise the population is mostly sedentary Koryak, who pursue fishing and the breeding of dogs. In the peripheral regions Chukchee wander more in the north as nomadic reindeer breeders, Koryak wander in the south, and Laumut and other Tungus in the west. Alternation between the excellent mountain tundra in the protected depressions in the winter forms the basis of their life. In large part, these people are still fully nomadic. However, everywhere among them the effort is being maintained to create fixed, permanent winter quarters; and thus with many of these tribes, especially with the Koryak, a transition to semi-nomadism can be determined. Collectivization also has not stopped at these peoples. In 1948 there were in the Koryak National Okrug 40 livestock-breeding kolkhoz (reindeer), in some of which slight quantities of potatoes and vegetables were cultivated. At 70 points along the coast the Koryak have been brought together into fishing collectives.

There are only a few settlements on the coast because of its 361 flat relief offering little protection from the storms. However, the locality of Anadyr', which has almost 2,000 inhabitants and lies at the mouth of the river of the same name, assumes a central position here. This town forms the entrance gate to the entire Anadyr' region [505] and is regularly visited by coastal steamers. A short while ago rather [135] large Eocene brown coal fields were found in the vicinity of the locality. The main deposit stretches opposite Anadyr' on the northern side of the mouth of the Anadyr' from the point where the Ugol'naya flows into the foot of the Zoloty Mountain Range. On both sides of the mouth of the Ugol'naya appear two seams, which have a thickness of 1.5 meters and 5.8 meters. Mining is already underway here /294/ and supplies the coastal steamers. In addition, Anadyr' is the central [255] station of state fishing on the entire northern coast; here the catch of the individual fish collection points are delivered and processed in an important canning factory.

Toward the southwest the Anadyr' depression goes over into the 133 Penzhina lowland, the two being separated only by a gently rolling watershed which is up to 331 meters high. The Penzhina lowland, however, is far smaller in size, and is drained by the Penzhina which

133 flows into the Sea of Okhotsk. In comparison with the Anadyr' region the climate here in the Penzhina lowland is somewhat milder. The [137] inclination of the ground is greater, and thus the moss steppes widely diffused here are not so very swampy: the larger rivers are accompanied by poplar forests almost everywhere. Toward the mountains there is the same alternation in the vegetation picture as there. At the mouth 361 of the Penzhina lies Kamenskoye, where the coastal steamers land. 563 The capital, Penzhina, itself is a small village lying in the middle of a lonely moss steppe in the interior of the region. Koryak constitute the majority of the small population. They are in part sedentary, living as fishermen in the villages, or they wander as nomads with their reindeer herds on the good grazing grounds of the moss steppes. 135 In the Tertiary layers, which fill the Penzhina basin, coal-bearing series have recently been found, which also contain lighter lignite in addition to brown coal of good quality. The deposits are said to stretch almost over the entire Penzhina basin.

133 On the east the Penzhina lowland is bordered by a flat mountain ridge, the Penzhina Mountain Range. The very long moss steppe, the Parapolskiy-Dol, whose character is like that of the Penzhina lowland, stretches on the other side of the Penzhina Mountain Range from southwest to northeast. In the south this moss steppe widens and traverses the entire land narrows which connects Kamchatka with the mainland. Here in the middle of the land narrows the moss steppe reaches a height of 155 meters.

The region between the mouth of the Anadyr' in the north and the land narrows in the south is taken up by a still little known central mountain range, which is usually designated the Koryak Mountain Range, after its principal population. This mountain range fills the entire area as far as the east coast, and its waters in the main empty into the Bering Sea. Traversing the land which is mostly formed like a high plateau are three lines of mountain ranges: the Pal-Mal, the Tingeney, and the Rarytkin Ridge. Like the entire Koryak Mountain Range generally, these three belong to the outer zone of the Tertiary faulting belt and are regarded as a continuation of the Kamchatka Mountain Range. In contrast to the interior which is like a high plateau with a general height of 500 meters, the rivers flowing toward the coast are deeply dug in, and thus from the sea an impression more like a mountain range arises. The bulk of the surface is covered with tundra, only the more protected places and valleys have forests. Reindeer-breeding Koryak inhabit the interior and also constitute the population of the /245/ fishing settlements on the coast.

population of the /295/ fishing settlements on the coast. The center 361
of the fishing and the processing of fish is Ust'-Apuka, west of Cape 543
Olyutorskiy.

Tertiary brown coal deposits have also been found in the Koryak 135
Mountain Range in Korff Bay in the south and in the Ugol'naya Bay in the extreme northeast. In Korff Bay the deposits have already been mined for years, and the coal from here is used to supply coastal shipping. The coal here is of Miocene age and is contained, as far as the supplies have been investigated to date, in 11 seams with a total thickness of 20 meters. In this the quality of the upper seams is very different from that of the lower seams. The uppermost seam represents typical lignite; the lower seams, on the other hand, are like a gleaming, bituminous coal. Mining is supposed to have been taken up in Ugol'naya Bay also, and a coal base is likewise supposed to have been erected.

Kamchatka Peninsula

Like a spearhead Kamchatka Peninsula projects toward the 133
south, separating the Bering Sea from the Sea of Okhotsk. The peninsula covers 270,000 square kilometers and has a length of 1,200 kilometers, which corresponds approximately to the distance from Berlin to Rome.

South of the Parapolskiy Dol plateau which stretches across the land narrows, the first lines of heights begin, and these then develop into two mountain chains as the peninsula widens. Between these two chains, the western and the eastern, is imbedded the valley of the Kamchatka River.

The low medium mountain range of the west increases considerably in height south of the Palana River. In the area of the Tigil' River the main chain is richly divided up, is accompanied by parallel chains, and reaches already a height of 1,650 meters. In the area around the source of the Bystraya and the Icha rises the truncated volcano cone of the Ichinskaya Sopka, which projects over its approximately 1,200 meter high ground area to the gigantic height of 3,607 meters. The mighty dome of the mountains is covered with glaciers, from which some hanging glaciers flow down. The water from the melting of these hanging glaciers has torn deep furrows. The Ichinskaya Sopka is the sole active volcano in the western half of Kamchatka; thick smoke rises constantly from its crater. South of the Icha the character of the mountain range changes basically. North of the Icha,

/33 Tertiary sandstone and eruptive elements predominate; but to the south, on the other hand, slate, granite, syenite, and porphyry appear predominantly, forming more massive ridges and round peaks. Gradually the height is lowered, and the western mountain range flows together with the eastern line of mountains to stretch then in a line to the southern tip of Kamchatka. The western mountain spurs and parallel chains have numerous old volcano cones, which often rise far beyond the vegetation line. The slender, basalt pointed cones of the Eleuken and the Moreshatnaya Sopka should be mentioned here above all.

/296/ From the sea there rises slowly a treeless moss steppe, which is often designated also as tundra. It rises to a height of 200 meters and then rises rapidly in mountainous forms to a height of 600 meters, whereupon the mountain range zone follows. Only in the extreme north, where the Penzhina Mountain Range stretches to the sea, is the west coast itself steep and also often rocky. For the entire remaining course of the coast, it is flat and represents a leveling coast /Ausgleichsküste/ with numerous narrow bays and coastal lakes. [34] Many settlements, however mostly only small ones, lie in the damp coastal plain, which is in part also swampy. These settlements lie almost always on the lower courses of the rivers at a distance of 10 to 20 kilometers from the mouth, approximately at the border where the forest along the valleys from the mountain range runs into the moss steppe.

The eastern half of Kamchatka likewise forms a medium mountain range, but it has numerous high volcano mountains, whose thick andesite masses traverse the greater part of the land from the middle Yelovka in the north to the southern tip of the peninsula. The number of volcanos, of which 18 are still active, is far greater than in the western chain. The volcanos here lie mostly between the main ridge and the coast. Of the active volcanos, the following are the most important: The Shiveluch (3, 335 meters) lies in the angle between the Yelovka and the lower Kamchatka. Its peak has six glaciers. The last eruption occurred in 1928. The Klyuchevskaya Sopka, which is likewise glaciated, rises to a height of 4, 775 meters south of the point where the Kamchatka River breaks through the eastern mountain range. The Klyuchevskaya Sopka is the highest point on the peninsula. The volcano cone, which projects to its mighty height directly from the plain of the Kamchatka River with a slope inclination of 30°, is among the most impressive volcanos on the earth. Its last eruption took place in 1931. However, the largest eruption took place before the arrival of the Russians in 1696, when a stream of lava flowed as far as the Kamchatka River in the vicinity of the village of Klyuchi, which lies 32 kilometers from the crater. Usually the peak is enveloped by a cloud of smoke, which in many cases rises 2 to 3 kilometers above the peak and from which a rain of ashes and stones often falls on the slopes. The crater has a diameter of 250 to 300 meters and a depth of 50 meters. Russian scientists were lowered into it in 1931. Their report (29) states: "Clouds of ashes and stones, many of which gleamed in bright red colors, were thrown up 200 to 300 meters and fell down with a rumbling noise. Thick, dark gray smoke perpetually filled the entire crater opening. A sharp smell of sulfur gases and hydrogen chloride filled the air. In the crater itself evening twilight and darkness prevailed, and against this the stones glowing in bright colors shone out all the more sharply and clearly. Indescribable din and deafening noise filled the entire area. During the sixteen hours of the stay in the crater an especially heavy eruption occurred. A mighty cloud rose up to the /297/ heights and poured a hail of glowing rock over the crater."

In the vicinity of the Klyuchevskaya Sopka lie the volcanos Ploskaya and Zamina, which are likewise covered with permanent snow, and farther to the south is the 3,682 meters high Tobalchik, which is known for its immense crater and for the largest glacier in Kamchatka. Farther to the south follows the Kronotskaya Sopka (3,620 meters), which was regarded as extinguished until it suddenly awoke again in 1922. At its foot lies the 128 meter deep lake of the same name, which apparently fills an old crater opening. Around it lies a series of high volcanos, of which the Uson deserves special mention. From its deep crater it throws up effervescingly through splits numerous hot springs which have temperatures between 52^{o} and 85^{o}. The Avachinskaya Sopka (2,731 meters), which at present is permanently active and which lies 30 kilometers northeast of Petropavlovsk, has a double crater and resembles Vesuvius in its structure and appearance, but it is more than twice as high. A last, larger eruption occurred in 1926. Since 1927 it has been throwing out ashes, steam, and gases continually. The lava of the Avachinskaya Sopka belongs to the

29. Berg, L.S., Priroda SSSR /The Nature of the USSR/, (Moscow, 1938), p. 227.

133 andesite type (172). Not far from the last volcano mentioned, the mighty but quiet Koryatskaya Sopka rises to a height of 3,457 meters, and next to it is the Sopka Zhupanova (2,929 meters). South of Avacha Bay the mountain range has many valleys because of the rivers streaming off radially in all directions; but down to the southern tip of the peninsula smaller extinguished and active volcanos lie on the mountain range. The height of the mountains here rarely exceeds 900 meters. The last group of volcano mountains, with the Ilinskaya (855 meters) and the Kambal'naya Sopka (1,615 meters), rises over an extensive region of mountains, which are gently inclined and like ruins, in the extreme south around Kuril'skoye Lake, which is 306 meters deep and which represents an old crater.

312 Related to the phenomenon of volcanos is Kamchatka's wealth of warm mineral springs. Of these the Nalychevkiye springs between Avacha Bay and the Sopka Zhupanova are worthy of note. These springs come from an andesite layer with a temperature of 72°, and they contain a great deal of borium and arsenic, which is deposited in terraces. Interesting pictures develop in the winter when the steam rains down in the environs and forms fantastic ice figures.

133 The east coast, in contrast to the west coast, is richly divided up by inroads. The projecting peninsulas mostly end with a steep, rocky descent to the sea. The bays, on the other hand, have a broad, flat, treeless strip, which has its greatest size at Litke Bay. Avacha Bay, too, on which Petropavlovsk lies, is surrounded by a coastal plain, which, however, is narrower here.

[30] Enclosed by the high lines of mountain ranges, which protect it from the damp, cold, foggy, snowy, and rainy climate of the coastal sides, the central Kamchatka valley is distinguished by a more continental /298/ climate, which, dispite the harsh winter, is found more pleasant by man than the constantly damp coolness of the coast. The river valley itself is swampy but it is accompanied by a grass steppe, occupied by a spotty stock of birches. This grass steppe offers good conditions for breeding livestock and is not unfavorable even for agriculture. After the break-through to the east the Kamchatka River ends in a wide, treeless delta, which has a special economic significance because of

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172. Savritskii, A. N. Piat' let geologicheskikh isledovanii Kamchatki /Five Years of Geological Research in Kamchatka/. Problems of Soviet Geology, 1935.

the schools of salmon which regularly press up the river here in immense masses for the spawning period. 133 [136]

The vegetation of Kamchatka, under the influence of the heavier rainfall and the milder temperatures, has another stamp from 137 that of the forest landscapes along the coast of the Sea of Okhotsk, and in the southern part of the peninsula the vegetation even attains an extraordinarily luxuriant character. The bright, shining green of the deciduous trees dominates the picture, and only in the interior of the Kamchatka valley does the dark color of coniferous forests with Daur larch and silver firs appear. There is on Kamchatka no forest of the type of the Siberian taiga. The characteristic tree here is the birch, and in the first place is the stone birch (Betula ermani) with its gray to red bark. However, the birches never come together in thick stocks; rather they always preserve a certain distance from one another, thus giving rise to a kind of park landscape. Along with poplars, alders, and mountain ashes, the birch covers the entire area of the eastern coast. The landscape here is magnificent when the red fruits of the mountain ash glow out between the various greens in late summer. However, the growth of trees ends on the eastern slopes at a height of 300 meters in the north and at a height of 550 meters in the south. The all too great, cool dampness no longer permits the growth of trees. From the interior of the Kamchatka valley, however, the same birch forest rises to a height of 600 to 750 meters. In the underwood of these forests the Kamchatka honeysuckle (Lonicera edula) is especially worthy of note. Its black-brown fruit is collected in August in large quantities as food by the inhabitants. At heights of 300 to 550 meters the birch forest gives way to the already often mentioned bent wood vegetation, which is especially typical for the mountainous sections of Kamchatka. It consists here of a confusion of entwined branches of creeping alder, Siberian stonebirch, and mountain ash, between which individual rhododendron types grow. These bushes cover whole areas and slopes, and are often so matted that a path through them must be made with an axe, unless one wants to follow a bear path; for the bear has withdrawn into this thicket and is still preserved today in larger numbers. At approximately 800 meters this bush formation ends and is replaced by the zone of the Alpine flora, which generally 133 reaches up to a height of 1,400 meters. The glacier line on Kamchatka lies at a height of 1,500 to 1,700 meters, and thus most of the volcanos have a snow cap, many volcanos are half covered by snow caps, and the Klyuchevskaya Sopka even is covered two-thirds by snow caps.

3: Thiel--348 K-4,5 (no date) 1953 RR1 Siberia RR1

● 133 These volcanos, /299/ projecting far beyond the general level, give
the landscape of Kamchatka its peculiar picture.

137 The bottoms of the valleys, if they are not too very swampy
and covered with moss, have luxuriant meadows, which appear especially
in the southern part of the peninsula and which offer excellent
[231] grazing ground for livestock. The introduction of the breeding of
livestock has, therefore, attained the greatest measure here, too.
To be mentioned especially as characteristic of the landscape picture
are the high-growing plants in these regions, especially the umbrella-
shaped "sweet grass" (Heracleum tanatum or Heracleum dulce),
[263] which grows up to 4 1/4 meters high and develops a stalk 12 centimeters
thick. The natives use the juice of this rapidly growing plant
[273] to sweeten their food; the Russians earlier extracted alcohol from the
plant by fermentation.

133 137 Entirely in contrast to the forest and park landscapes of the
mountain regions which are rich in vegetation, are the tundra-like
moss steppes which stretch in a broad zone along the entire western
coast. In the east, on the other hand, these moss steppes form only
a narrow rim around the bays. Occasionally these steppes occur also
in the valleys of the mountain ranges. These monotonous regions are
depressingly dismal and gloomy especially when a veil of fog hangs
over them and prevents seeing any distance.

161 The population of Kamchatka according to estimates, scarcely
numbered 20,000 in 1914, and the native element was in the majority
at that time. But after World War I and up to the present the population
has multiplied because of the increased immigration of Russians, and
by 1945 the population was given at around 100,000. Thus today the
Russians are predominant, constituting approximately 80 percent of
the total population. Today their number is estimated to be at least
150,000. The sedentary population is divided among three lines of
settlements: the east coast, the west coast, and the Kamchatka Valley.

563 The Koryak and Kamchadal constitute the bulk of the native
population. The Koryak occupy the northern half of the peninsula
and the adjoining mainland between the Penzhina depression in the
west and the coast of the Bering Sea on the east. On Kamchatka itself
they live on the west coast as far as the Sopochnaya River in the
south and in the region around Litke Bay. In the Kamchatka valley
itself they are no longer to be encountered. Their region of residence
has been brought together into a national okrug, in which they, as
well as the Chukchee, enjoy cultural autonomy. The capital of their

with islands.

361 The main locality on the west coast is Bol'sheretsk. It is the
228 center of the crab and salmon fishing industry. All the catches of
the numerous fish collection points flow in here for processing. The
main fishing regions stretch from Cape Subchatyy to the southern tip
of the peninsula, i.e., more in the southern half of the coast. Further
to the north lies Palana, the cultural center of the Koryak.

371 In the future development of Kamchatka, exploitation of the
natural resources will play an important role. The supplies of coal
and oil have already been treated in detail in another place, and thus
only a mention may be sufficient here. Also water power rich in
energy is available here. Up until now only small water-power stations
for supplying agriculture have existed, although there are also vast
possibilities here. Thus Kamchatka shows a relatively favorable
picture of its economic development to date with further good prospects
for the future.

Commander Islands

• 133 Approximately 250 kilometers east of Kamchatka there arise
alone from the sea the Commander Islands. They are separated from
the peninsula by a sea channel which is 1,000 meters deep, while
toward the Aleutians the floor of the sea sinks down deeper. The
island group, which covers 2,150 square kilometers, consists of two
large, inhabited islands, Bering Island and Copper Island, and of two
small islands, on which only large numbers of sea parrots and aras
make their home. The islands are of volcanic origin and consist
principally of andesite tuff and basalt.

Bering Island forms in the north a flat, low-lying moss steppe,
while a wild highland traverses the southern part. This highland projects
132 up to 670 meters. The damp, cold, constantly foggy and rainy
weather (coldest month -4°, July +11°, annual rainfall 500 millimeters)
and heavy storms permit only a crippled growth of mountain ash and
137 willows to come up. The islands lie at the latitude of Moscow. All
the more luxuriant is the growth of grass; the Hercules types, which
grow to more than the height of a man, are especially striking.

133 Copper Island received its name from the copper enclosed in
the volcanic stone. It is formed from a mountain ridge, which is
divided into two parts by a land narrows and which descends steeply
to the sea. The mountain ridge is broken up by several cross valleys.

The coasts are rocky and steep and are torn up into adventurous, picturesque forms by the heavy breakers. Thus the coasts project a romantic-dim picture in the fog. Thousands of birds make their home on the rocks. 133•

The Commander Islands have become famous for the catching of sea otters (seals) there, but this wealth is almost completely destroyed today. The 600 inhabitants, which consist of a mixture of Aleuts, Russians, Eskimos, Kurils, etc., live almost exclusively from what the sea offers them. On the land itself foxes are hunted. 225 161 224

The Kurils

The island garland of the Kurils came to the Soviet Union after the end of World War II. These islands are not too well known, and therefore somewhat more space is to be devoted to them. 133

The Kurils, along with Hokkaido and Kamchatka, form the most northerly arc of the outer frame of the east Asiatic continent. The Kurils represent a connection between the volcanic massif of Hokkaido Island and the volcanos of Kamchatka. To the island chain belong 36 islands which are larger in terms of area, 20 smaller islands, and many uninhabitable rocks, which often barely project from the sea. According to the local division of the islands, the Kurils can be divided into a 1,200 kilometer long main chain, which begins in the north with Shimushu Island and ends with Kunashiri Island off Hokkaido, and into a second, parallel chain, which, however, is only approximately 100 kilometers long. This shorter chain begins at Hokkaido with Nemuro Island, stops with Shikotan Island, and lies east of the main chain. The entire area of the Kurils is given at 15,600 square kilometers, of which 40 percent is on the four largest islands, namely Etorofu, Paramushiru, Kunashiri, and Uruppu. The most northerly island in the chain, whose name is Araito, lies under 50° 56' N latitude, while the most sourtherly lies under 43° 26' N. The Kurils, therefore, lie approximately at the latitude between Leningrad and Burgas in Bulgaria.

/304/ The understructure of the Kurils rises like a mountain ridge from the floor of the sea, whose highest parts project beyond the surface of the water as islands. The slope of this submarine ridge has various forms. Toward the Sea of Okhotsk it declines relatively steeply to a depth of 3,000 meters (the greatest depth is 3,374 meters). The slope toward the Pacific is bigger, for here the Kuril deep sea graben extends along the island chain. This graben has depths between 7,000 meters and 8,000 meters, and its greatest depth is 8,514 meters. The descent to this extraordinary depth occurs still more quickly than on the western side. With individual islands the 200 meter isobar often lies right off the steep decline of the rocky edge of the shore. The islands are separated from one another by sea straits, which are of greatly varying width and depth. Busole Strait, which is more than 2,000 meters deep, and Muzhir Strait, which is 1,800 meters deep, have the greatest depths. All the other sea connections only have depths under 600 meters, and they are in part also only very shallow. A limited exchange of water between the Pacific and the Sea of Okhotsk takes place via these sea straits.

According to the results of research to date, the Kuril chain lies on the surface of an old fault zone, which is buried deeply in the sea and which is of Paleozoic and Mesozoic age. This fault zone was submerged in the formation of the east Asiatic geosyncline. The formation of the latter began in Lower Cretaceous. Miocene was the time of increased sinking, in which thousands of meters of sediments were deposited. On the other hand, the sinking caused faults, strains with thick intrusions of magmatic masses on the eastern edge of the geosyncline, i.e., along the line of the present-day Kurils. At the end of the Tertiary extended longitudinal and also cross breaks came into being. Along the longitudinal breaks there were eruptions and further elevations, while on both sides the ground sank down and formed as an end result a narrow mountain ridge accompanied by deep channels. Thick lava intrusions followed and led to the metamorphization of the sediments broken through. Mighty masses of lava flowed out and formed volcano cones, which projected from the sea as islands. The movement of the earth's crust and the formation of islands have also not been concluded in the present and are shown in the intensive volcanic and seismic activity and also in the elevation of the islands, to which numerous sea terraces give proof.

Almost all the islands consist basically of eruptive rock (andesite lava and tufa); only most northerly (Shimushu) and the most southerly (Shikotan) are formed exclusively from sedimentary rock. On some islands there appears under the lava covering heavily dislocated and metamorphized slate of Paleozoic and Mesozoic age. Also weakly processed formations of the Tertiary are shown in some basins.

The Kurils are typical volcano formations. Fifty-two volcanos have been /305/ counted on them. Of these eighteen are still active today. Of the latter the highest are the Syrycheva on Matsuwa Island and the Prevo on Shimushir Island. The Syrycheva is 1, 485 meters high, and the Prevo is 1, 360 meters. Extinguished volcanos attain greater heights. According to their structure, the majority of the volcanos are the layer volcano type. The present volcanic activity varies greatly from volcano to volcano. With many (Raikoke, Shimushir), the entire cycle is gone through, from subterranean rumbles to the outburst of gases, the throwing out of ashes and bombs /Bomben/ and finally the explusion of lava. With other volcanos (on Matsuwa and Chirinkotan Islands) the lava flows quietly without collateral phenomena. With many volcanos only one crater exists, with others side craters break out, while constantly working fumaroles form over the splits.

The northwestern part of the Pacific Ocean is distinguished by heavy earthquake activity. Of all the seismic occurrences of the earth which are known, 37 percent occur in the area, and the bulk of these occur in the Kuril chain. The appearance of earthquakes varies greatly within the area of the islands; with many islands they occur up to seven times a year, with others they occur less often. For the most part the earthquakes are related to tectonic occurences on the floor of the sea. The earthquakes have their epicenter as a rule deep under the floor of the sea. Very often submarine outbreaks also result. In many cases there is a connection with the volcanic activity on the islands. The earthquakes themselves do not have the greatest destructive effect on the islands; rather the submarine occurrences do, since they often produce mighty flood waves which storm against the islands with great force and repeat themselves several times. Flood waves of this type have been observed with a height of up to 27 meters. In 1780 a ship lying in the harbor was carried onto the land 400 meters in the interior of the island by such a waves.

The orography and the forms of the Kurils vary greatly. Usually the larger island is traversed lengthwise by a single mountain ridge, which mostly fills the entire island. In many cases also there are two to four mountain chains, or the islands are taken up by an entire system of individual mountains. The mean height of the mountains lies between 500 meters and 1, 000 meters, but thirty mountains have been counted with heights between 1, 000 meters and 1, 300 meters, and there are twelve mountains which exceed 1, 300 meters, The northern island, Araito, has the highest mountain, the volcano Oyakopa, which is 2,334 meters high. It is covered with permanent snow, which comes down the slopes to 800 meters. There is also permanent snow on the other very high mountains. Plains and hilly areas occur very seldom on the islands. The gently rolling Shimushu Island in the north and Shikotan in the extreme south constitute a rare exception. Neither, as has already been stated, is formed from volcanic rock, but rather from sediments, and they are regarded by many researchers, therefore, as parts of the mainland which have been cut off.

/306/ The volcanos in their forms are a true collection of models of all types from the ideal volcano cone to volcano ruins. Craters of old volcano ruins on the coasts which are filled with sea water form excellent, protected bays such as, for example, Buron Bay on the island of Shimushir. This bay is 200 meters deep. Often small island groups, through their circle-shaped ordering, indicate the existence of a submarine crater.

In their horizontal division most of the islands show regular forms. Besides round to oval islands, which as a rule are crowned only by a volcano group, there appear above all long stretched out islands. The latter apparently have come into being by the growing together of individual islands. To accomplish this the base was enlarged through an elevation of the land, and the holes were filled by the flow from volcanos. In addition to these two main groups there are also isolated examples of very much torn up islands. The coastal forms are almost everywhere the same. The predominantly steep slopes in the interior of the islands become gentler toward the coast, but then they descend to the waterline in a steep descent which is often almost perpendicular. Off the coasts and between the islands there are numerous rocks, reefs, and banks, which are very dangerous for ships. Volcanic eruptions and earthquakes bring forth manifold changes in the course of time, often within short periods of time and before the eyes of men. Thus in 1937 a volcano island emerged from a depth of 800 meters approximately 20 kilometers off the coast of the island of Araito. The force of the sea is continuously active on the coasts. Washed-out grottos and niches are everywhere to be found in the steep slopes. The most important occurrence, which, however, acts differently in the individual sections of the island arc, is a general elevation. Beach lines and erosion terraces have been established on the slopes up to a height of 300 to 400 meters.

Weathering is very great. On the heights and slopes lie hurled off, angular pieces of rock, which, when the inclination is greater, tumble down and form true "rock seas" at the foot of the mountains. 133 The river valleys are deeply etched in the mountain massif and extend from the highest elevations radially to the sea. Often they end in bays, which are filled with deposits and thus afford favorable opportunities for man to go onto the land. In many cases, on their way to the sea these rivers have dug deep, narrow gorges in the volcanic stone, but often because of the elevation, the rivers have not had time to sink down to the level of the sea. Thus they tumble into the sea as a waterfall at the steep break on the coast.

The climate of the Kurils is raw and brings a cold, long, and 134 relatively dry winter and a cool, damp summer. The climate stands completely under the influence of the monsoonal circulation of air. In winter northwestern winds prevail (70 percent); they have great strength (the monthly /307/ mean velocity of the wind is 14 meters per second) and there is slight relative humidity of the air (60 percent). In summer southern and southeastern winds prevail, but they generally are weaker than in the winter and are often interrupted by calms. The relative humidity of these winds reaches 90 percent. At the end of the summer and in the beginning of the fall very heavy winds, which can attain a velocity of up to 74 kilometers per hour, appear as spurs of southern typhoons. The fluctuations in temperature are not very great (21° to 23°), the mean temperature in the coldest month lies between -5° and -7°, and the mean temperature of the warmest month lies between 14° and 17°. The number of frost-free days is 120 in the north and increases to 180 days in the south. The rainfall ranges from 750 millimeters to 1,000 millimeters, and in the course of the year it has its maximum in August/September and its minimum in January/February. Only approximately a third of the days are without rainfall. Snow begins to fall already at the end of October and lasts on the northern islands until the beginning of May. The snow covering reaches a thickness of 100 centimeters. The cloudiness is very heavy. On many islands only 15 to 30 clear days have been observed in a year. The most beautiful season is the fall, which has the most still and rain-free days. Characteristic phenomena of the Kurils are the numerous thick fogs, which appear primarily in the summer and arise when warm-damp air masses from the Pacific move over the cold Oyashio /Okhotsk Current/. The fogs, as a rule, do not have great thickness, and thus the peaks of the mountains often lie in the sunshine, while all the rest of the island is enveloped in thick fog. The fogs are an extraordinary hindrance to shipping and bring many dangers. From